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AUTOMATIC SUBSTATIONS.

Among the papers presented at this year's convention of the American Institute of Electrical Engineers, that by H. S. Summerhayes, which described an automatic substation which is in operation in Detroit, is worthy of particular notice.

The advantages of automatic operation are quite evident. The elimination of manual labor is desirable in every activity of life, and it is because so much has been accomplished in this direction that our present-day civilization excels that of previous periods. From the standpoint of economic management this feature is becoming of more and more importance with the rise in the cost of labor. Where a large investment is concerned the added expense of an operator may be of small importance. In a small station, on the other hand, this element may be a vital one, and the successful operation of such a station without any attendant points the way to a solution of a problem which is confronting many operating companies. Especially where the undesirability of stationing a single attendant in a station is recognized, the entire elimination of anything except regular inspection will be much appreciated.

The plant in question is a small one, the capacity being but 500 kilowatts, but the same method of control and the same degree of security could be equally well attained in a station of large capacity. Even in stations where attendants are at hand, reliance must usually be placed upon automatic safety devices for the protection of apparatus, and it is only in relation to continuity of service that the automatic station may, perhaps, compare unfavorably with the other type. Experience in Detroit up to the present time, however, does not indicate any advantage even in this particular. Safety devices provide for every contingency, such as overload, short-circuiting, etc., which might damage the apparatus.

With the modern perfection of alternating-current motors, the general tendency on distribution circuits has been towards alternating current. There are, nevertheless, many districts in which direct-current systems are in operation and the growth of these makes it at least desirable, if not necessary, to extend the field of direct-current supply. For this reason the availability of a converter station which, on the score of attendance, can compete with an alternating-current transformer station is an important point. The possibility of its operation permits the extension of the limits of direct-current systems and

the utilization of smaller substations placed more closely together than would otherwise be possible.

The substation in Detroit described by Mr. Summerhayes is only about a mile distant from the station which controls it, but this distance could just as readily be indefinitely extended. Control is exercised over the three-conductor, 4,400-volt cable which supplies the power, no auxiliary control wires being used. The rotary converter can be started or stopped and the voltage regulated from the control station. Polarity can be controlled without difficulty, since in this case there is an independent supply of direct current, due to the fact that the distribution feeders form a network in connection with other substations. However, this is not an essential element of the system, and proper control of polarity can be secured even where there is no other source of direct current. It has been announced, moreover, that an automatic circuit-breaker is about to be put on the market which will have a resetting device which will also be automatic in its operation.

The application of this method of control to synchronous condensers on alternating-current lines would make it possible to control the power-factor on a line where it is not convenient to have synchronous machinery requiring skilled attendants. This is a problem which frequently comes up, more especially on lines having a large motor load, and a means of power-factor correction which could be controlled from a distance would be heartily welcomed.

A GENERAL ENGINEERING SOCIETY.

A proposal at the Institute convention which attracted considerable favorable comment was that by Dr. William McClellan, who advocated the formation of a national engineering society.

The need of a body of this kind has been generally felt for some time, but a feasible scheme for bringing it into existence has been lacking. The consolidation of the present national engineering societies could hardly be expected to be favorably received in all quarters, and the formation of a new society with a general membership has been frowned upon in these days of multiplied organizations.

Dr. McClellan's proposal is to make the new society an association of the national societies already in existence and to have no individual personal membership. Such an organization would represent before the country the combined strength of all the national societies participating and would thus fulfill the functions of a general engineering society with individual membership of national scope. It is to be hoped that such an association will be organized.

There are many ways in which such an association could fulfill functions which are not now exercised, but which would be for the general good not only of engineers, but of the country at large. There are many national questions of general engineering interest continually coming up, but there is at present nobody in a position to speak upon these subjects authoritatively for the engineering world. Questions of legislation, of government policy, etc., are bound to arise at intervals, and there is, moreover, a general public opinion which needs leadership which shall have both an engineering and a popular basis. In many ways a representative engineering body might exercise a wholesome influence in public affairs.

It is frequently lamented that engineers do not take the active interest in political and civic affairs and exercise the influence which properly belongs to the profession. While there are notable exceptions to this statement it must be admitted that as a general proposition it is true. While the professional politician has been losing the dominating grasp which he once had in all governmental matters, the general cry has been for business administration. As a matter of fact engineering administrations are quite as much needed as business administrations. Indeed the best results in government cannot be attained until we have represented in public offices not only business ability, but a knowledge of both engineering and economic principles. It is but right that engineers make their knowledge and influence felt in public administration and they have in this connection also a duty to the public which should not be shunned.

ELECTROLYTIC CORROSION OF IRON.

The electrolytic corrosion of iron imbedded in the soil or in concrete has been recognized for some years as an important problem. Evidences of such corrosion began to appear soon after the adoption of electric traction with ground return, and the ever more widespread adoption of this system has but served to multiply the evidence of this action. In many cities where there is considerable piping under ground it has become an acute question. Any investigation which supplies additional information upon this subject must be regarded as an important contribution to engineering. For some years the Bureau of Standards has been investigating this subject and the paper by Messrs. McCollum and Logan at the Institute convention contains a number of important results.

It has been found that the destiny of current is an important factor in determining the amount of corrosion produced. That is to say, the same number of ampere-hours will have a much greater effect when distributed over a long time or over a large area than when concentrated in larger currents or smaller areas. Temperature has little effect upon the electrolytic corrosion in soil except insofar as it may alter the conductivity of the surrounding medium. Thus, when frozen, the conductivity of soil is largely reduced and consequently corroding currents will be much less in value under this condition. The presence of moisture in the soil has an opposite effect, since it increases conductivity and hence pro-

vides a condition which is conducive to the flow of current.

The presence of air has little effect upon the amount of corrosion, but will influence the chemical composition of the oxide. Little difference was found in the corrosion effect upon different varieties of iron and steel.

A definite knowledge of the effect of these various conditions will be of great assistance in obviating such troubles in the future. It has been customary to attempt to limit electrolytic disintegration by keeping down the voltage drop which would produce earth currents. In view of the fact that the effect is proportionately less with the higher currents and that the effect is cumulative, it is evident that a temporary high voltage is not an important factor in the problem and that where a fluctuating voltage is involved the time integral is of much more importance than the maximum value. Again, a given voltage will produce much greater effects under conditions of good soil conductivity, etc., than a larger voltage would where conduction through the soil is poor.

Other experiments at the Bureau of Standards have had to do with the electrolytic corrosion in reinforced concrete. It has been shown in these experiments that effects may be looked for at both the anode and the cathode. At the anode the corrosion effect is evident and is largely influenced by the temperature. Very little corrosion takes place at ordinary temperature. The effect of the applied voltage here becomes of importance, since a large voltage drop in the concrete will heat it up to the point of rapid corrosion, which is in the neighborhood of 45 degrees centigrade. When the corrosion is active it soon results in cracking of the concrete, due to the pressure produced by the swelling of the iron in forming oxide.

At the cathode there is no corrosion of the iron, but the accumulation of alkali results in disintegration of the concrete in the immediate vicinity of the iron and the destruction of the bond. This is evidenced by discoloration of the concrete.

TECHNICAL ADVERTISING.

It is foreign to the usual policy pursued by this journal to discuss in its reading columns the question of the technical journal as an advertising medium. An opportunity has presented itself, however, and is embraced with pleasure. We are glad to print on other pages of this issue the address delivered by Mr. Charles L. Benjamin, advertising manager of the Cutler-Hammer Manufacturing Company, before the convention of the Associated Advertising Clubs of America at Baltimore last month. Technical and trade journals are growing in the appreciation of the manufacturer as a medium of direct appeal to the user of machinery and materials of construction, and no industry is better served than the electrical industry by its technical publications. Mr. Benjamin's address is commended to the industry, not only for its logic, and its instructive features; but also as an example of that limpid, easy facility of expression that seems unfortunately to have gone out of fashion in the preparation of the literature of commercialism which he so ably discusses.

CONCERNING SPECIFICATIONS.

Nearly a year ago there appeared in these columns an editorial criticism of the practice of padding specifications for electric wiring with excerpts from the National Electrical Code. It is a fact that is well known that it is not unusual to find sets of specifications which contain little else than paraphrased statements of Code requirements, while it seems to be unusual for even the best drawn specifications not to contain enough of this sort of thing to make it conspicuous. A plausible excuse for such padding is hard to discover; there is certainly none apparent. Most electrical contractors keep a copy of the Code conveniently at hand, and there are few of them who have not a working acquaintanceship with its requirements. Hence the preface with which specifications are generally supplied, to the effect that the work contemplated must conform to the rules of the National Electrical Code and to those of the local inspection bureau, is all that is needed so far as the rules go. The square yard is never the unit to be employed in estimating the value of a specification. Verbosity is a defect.

At a meeting of a body of technical men not long ago a speaker who had evidently had wide experience with specifications for electric wiring criticised the practice referred to above and also went on to insist that specifications were frequently very indefinite on points concerning which definiteness was vital. Therefore, the electrical contractor was liable to find it difficult and expensive to draw plans which would be satisfactory to the author of the specifications. Concerning this contention one is inclined to add that lack of definiteness is also liable to furnish the contractor whose zeal for low prices exceeds his zeal for high-grade work opportunities for taking unfair advantage of competitors who figure on doing first-class work. There have been times, for example, when the man who got the job installed only the cheapest possible arrangement of cutout blocks at the distributing centers, whereas his competitor had figured the job on the assumption that standard panels installed in the best manner were to be used.

Nevertheless, specifications can be too specific. On most big jobs of electrical construction there are many details that the specifications ought not to undertake to work out. Different contractors employ different sorts of construction for accomplishing the same purpose and the plan of one man may be about as good as that of another. Wherever this could be the case, it is generally sufficient that the specifications state what is to be done and allow the contractor to explain how he proposes to do it.

CONVENTION OF THE NATIONAL ELECTRICAL CONTRACTORS' ASSOCIATION.

Chattanooga, Tenn., July 15 to 19, Inclusive.

The thirteenth annual convention of the National Electrical Contractors' Association will be held at Chattanooga, Tenn., from July 15 to July 19, inclusive. An elaborate program of business and entertainment has been prepared, and it is expected that this will prove to be the most interesting convention that has ever been held by the Association. Headquarters will be established at the Hotel Patten. On July 15 there will be a meeting of the directors and the executive committee. The convention proper will be opened on the morning of Wednesday, July 16, with an open session at which three prominent speakers will address the convention. A business session will be held at 2:00 p. m. for members only. At 8:00 o'clock in the evening there will be a reception and dance at the Hotel Patten, and during the reception there will be introduced a genuine Southern cake-walk for valuable prizes.

On Thursday, July 17, a business session for members only will be held at 10:00 a. m. The afternoon will be devoted to an automobile trip starting at 2:00 o'clock, going over the battlefields, Chickamauga Park, and at Fort Oglethorpe, there will be a special cavalry drill for the benefit of the convention visitors. In the evening there will be an illustrated lecture on illumination at 7:00 o'clock, and at 9:00 o'clock there will be a rejuvenation of the Jovian Order.

On Friday, July 18, there will be business sessions both morning and afternoon, one at 10:00 o'clock and the other at 2:00 o'clock. For the ladies and guests there will be tea at 3:30 o'clock tendered by the Chattanooga Electric Club. The annual dinner of the Association will be held at the Hotel Patten at 8:00 o'clock on Friday evening, and this will be followed by a vaudeville performance.

The last day of the convention, Saturday, July 19, will be devoted to an elaborate outing. At 10:00 o'clock in the morning the party will start for a trip over Waldron's Ridge to Signal Mountain. Luncheon will be served at the Signal Mount Inn shortly after noon, and after luncheon the trip will be continued, returning to Chattanooga early in the afternoon. The party will go directly to the Union Station where a special train will convey the visitors to the Tennessee lock and dam, where an inspection of the hydraulic installation will be made.

The electrical contractors of Chattanooga, Tenn., are very enthusiastic over the approaching convention. The local committee on arrangements, which is now very busy completing preparations for the big meeting, consists of F. H. Cantrell, J. Pink Lawrence, E. L. Scott, Joseph Fowler, W. C. Teas, P. A. Curtis and R. H. Scott.

Among those speaking at the opening session on the morning of July 16 will be J. Pink Lawrence, representing the Tennessee association of contractors; Ernest Freeman, president of the National Association; and A. M. Schoen, of the Southeastern Tariff Association.

Board of Directors of Society for Electrical Development Holds Meeting.

The directors of the Society for Electrical Development met in New York City on the afternoon of July 9. President Henry L. Doherty occupied the chair. There were also present W. H. Johnson, W. E. Robertson, A. W. Burchard, Ernest Freeman, J. Robert Crouse, J. M. Wakeman, P. S. Dodd, E. W. Lloyd, Franklin Overbagh, J. R. Strong, E. W. Rockafellow, H. M. Wilson and Charles W. Price.

After a long session at which all details were thoroughly discussed, a campaign committee was appointed to actively prosecute the work of the Society. This committee consists of Messrs. Crouse, Robertson and Lloyd.

The board of directors adjourned to meet on August 18.

Marconi Contract Abandoned by British Government.

The British Government has decided to abandon the idea of enforcing upon the Marconi Company performance of the contract for an imperial system of wireless telegraphy. The Parliamentary Committee of Inquiry has completed its work and met for the last time. After the institution of this inquiry and delay of the Government in putting the contract into execution, the Marconi Company threw up the contract. The Government does not admit that the company is entitled to do this, but does not consider it advisable to undertake legal proceedings either to enforce performance or obtain damages.

Goldschmidt Wireless Tests.

Wireless communication is reported to have taken place between Hanover, Germany, and Tuckerton, N. J., the sending station using a Goldschmidt high-frequency generator and a wave-length of 7,500 meters. The distance is 3,600 miles and the power used was 150 kilowatts.

Exhibits at Panama Exposition.

A. M. Hunt, chief of the Department of Machinery Exhibits, reports that in corresponding with manufacturers of electrical machinery and appliances with reference to exhibiting at the Panama-Pacific International Exposition in San Francisco in 1915, the replies received indicate that in some cases manufacturers do not feel justified in the expense required to make such an exhibit, and for this reason do not intend to show their lines. This is especially the case with those manufacturers who build minor devices, which, although of great interest from an exhibit standpoint, do not justify the expense of maintaining an individual representative in San Francisco during the Exposition period.

The Department of Machinery Exhibits will be very glad to co-operate with such manufacturers to make it possible for them to show their lines at reduced cost in accordance with the following suggestion.

If several such manufacturers club together, and make their individual applications for space for showing their products, and express their desire to have it done, they will be assigned space in such a way that their exhibits may be grouped together, and expense can be very greatly reduced, and the effectiveness of the exhibit enhanced. If this is done, each exhibit will be considered by the Jury of Awards in the same manner as if handled independently.

It would perhaps not be wise to include in any group directly competitive articles, but it should be possible to work out groups of devices which are more or less related to each other, and yet do not come into direct competition. As a concrete example, circuit - breakers, switches, fuses, porcelain goods and other supplies, made by different manufacturers, might very well be grouped in one exhibit.

The Department of Machinery Exhibits will be pleased to hear from any persons who are interested in such a plan, and will cheerfully furnish any information possible to aid or assist intending exhibitors.

Electric Vehicles at New York Show.

The automobile track at the New York Electrical Show, which will be held in October, will be conducted under the auspices of the New York Electric Vehicle Association, which has appointed a special committee to look after the matter. The chairman of this committee is S. W. Menefee. It is expected that arrangements will be made to provide instruction in operating and charging electric vehicles. Prospective purchasers will have an opportunity to try out machines and it may be that contests will be arranged.

W. F. M. Goss.

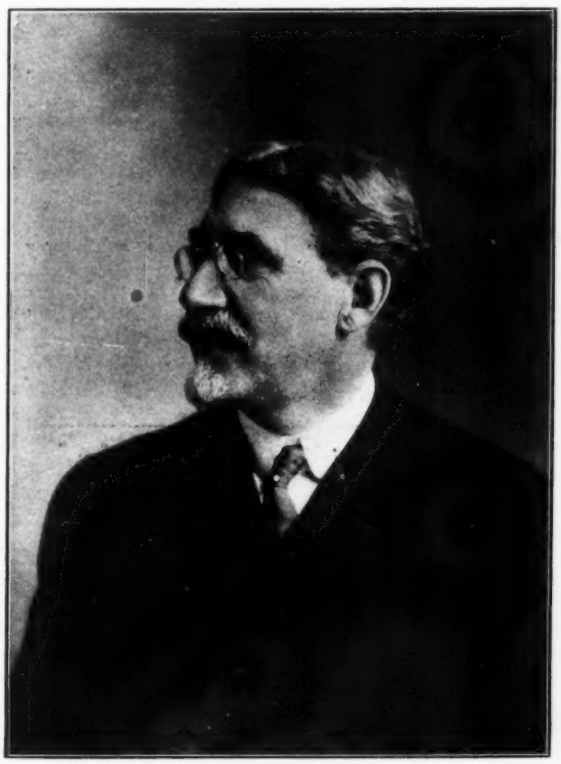
Two civic questions that have given the city of Chicago a great deal of concern are the abatement of the smoke nuisance and the electrification of railway terminals. Conspicuous in the movement for the improvement of matters in this connection has been the work of the Chicago Association of Commerce and upon the death of Horace G. Burt, chief engineer of the Chicago Association of Commerce Committee on Smoke Abatement and Electrification of Railway Terminals, the Association had before it a weighty question of finding a suitable successor. It is with great satisfaction that the selection of the incumbent for this position has fallen upon Dean Goss, of the University of Illinois. Dr. Goss brings to the position great capabilities and a wide experience in mechanical and electrical engineering in their many phases.

William Freeman Myrick Goss was born in Barnstable, Mass., October 7, 1859. He graduated from Massachusetts Institute of Technology in 1879, and received the degree of Master of Science from Wabash College in 1888, and the degree of Doctor of Engineering from the University of Illinois in 1904.

After his graduation from Massachusetts Tech, he went to Purdue University, remaining there until called to Illinois. He was instructor in practical mechanics from 1879 to 1883, and professor of practical mechanics from 1883 to 1890. From 1890 to 1907 he was professor of experimental engineering, director of the engineering laboratory, and dean of the schools of engineering. He became professor of railway engineering, director of the school of railway engineering and administration, and dean of the College of engineering at the University of Illinois in September, 1907. The University has now granted him leave of absence to be free to undertake the work of directing the completion of the investigations of the Association of Commerce Committee.

Dr. Goss is president of the American Society of Mechanical Engineers, a member of the International Association for Testing Materials, of the Society for the Promotion of Engineering Education, of the Illinois Academy of Science, the Western Society of Engineers, the Master Car Builders' Association, the Master Mechanics' Association, an associate of the American Institute of Electrical Engineers, and a fellow of the American Association for the Advancement of Science.

Dr. Goss was for many years a contributing editor of the *Railroad Gazette*. He is the author of several books and a number of scientific papers. He was chairman of the advisory committee of the Pennsylvania Railroad, charged with testing locomotives at the Louisiana Purchase Exposition, and a member of the executive committee of the national advisory board appointed to test fuels and structural material. Dr. Goss has been closely associated with many different engineering interests in Chicago. In 1893 he was a member of the Jury of Awards of the Columbian Exposition.



W. F. M. Goss,
Chief Engineer of Chicago Association of Commerce Committee on Smoke Abatement and Electrification of Railway Terminals.

For a number of years he has been a member of the Western Railway Club, and has served as its president. He has showed great activity in giving publicity to the work of the experiment stations of the University of Illinois, and under his direction the publications of these bureaus have contributed very materially to the literature of the various subjects which come under their investigations.

Program of Ohio Electric Light Convention.

The nineteenth annual convention of the Ohio Electric Light Association will be held at Cedar Point, O., on July 15, 16, 17 and 18. Headquarters, as usual, will be at the Breakers Hotel. The Executive Committee will meet on Monday morning, July 14. Other committees will meet on Tuesday morning and the first session of the convention will be held on Tuesday afternoon, July 15, at two o'clock. At this session the address of the president, J. C. Martin, will be presented, as well as reports of the secretary and of various committees. There will also be a paper at this session by Mathias Turner, of Cleveland, entitled "Cooking by Unity-Load-Factor Electric Ranges." Mr. Turner will also make a demonstration of the electric range at this session.

Other sessions will be held on Wednesday morning, Thursday morning and Friday morning. Wednesday will be known as "Commercial Day." There will be papers by Thomas F. Kelley, of Dayton, on "Retention of Business of Dissatisfied Customers;" by J. E. North, of Springfield, on "New Business;" by F. C. Caldwell, of Ohio State University, on "New Applications of Electricity as an Adjunct to New Business;" by H. E. Armstrong, of East Liverpool, on "Developing and Diversifying the Present Load." The election of officers will take place at this session.

On Thursday there will be reports from the Meter Committee and the Electrical Transmission Committee and an address by S. G. McMeen, of Columbus, on "The Human Equation."

At the final session on Friday morning there will be papers by James V. Oxtoby, of Detroit, on "Franchises," and by A. M. Seeger, of Toledo, on "Illumination as a Commercial Product."

On Tuesday evening there will be a musicale in the hotel lobby at eight o'clock, followed by an informal ball. On Wednesday afternoon there will be a launch ride for the ladies and a waterball game for the men. In the evening there will be a banquet, followed by a vaudeville entertainment. On Thursday afternoon there will be a musicale and card party for the ladies and a baseball game for the men. In the evening the Jovians will have a rejuvenation. There will also be a musicale in the hotel lobby, followed by a ball. On Friday there will be music and bowling for the ladies.

Mrs. Elizabeth Frease Smith of Canton, O., will be soloist at the musicales and Miss Helen Root, also of Canton, pianist.

The secretary of the Association is D. L. Gaskill, of Greenville, O.

Rapid Transit in New York.

The Public Service Commission for the First District has published a pamphlet describing the Dual System of Rapid Transit in New York City, the contracts for which were recently signed by representatives of the City, the Interborough Rapid Transit Company and the New York Municipal Railway Corporation. In this pamphlet it is stated that the estimated total cost of the new system is $337,000,000, of which New York City will supply about $171,000,000 and the two companies the remainder. The Interborough's total expenditure will be about $105,000,000, of which $58,000,000 will go toward the construction of city-owned lines. The New York Municipal Railway Corporation will expend about $61,000,000, of which about $14,000,000 will be applied to the cost of city-owned lines. The balance of each company's expenditure will be devoted to the purchase of new equipment and the construction of elevated railroads and additional tracks thereon. It is expected that the rapid-transit facilities will be more than trebled upon the completion of the new system in the year 1917. The existing lines cover 296 miles of single track, whereas the total length of the new system will be 618 miles of single track. The existing lines are carrying about 800,000,000, passengers per annum, and it is expected that the Dual System, used to its full capacity, will carry more than 3,000,000,000 passengers per annum.

Electrical Exports for May.

The Bureau of Foreign and Domestic Commerce, Washington, D. C., has issued its monthly summary of the imports and exports of the United States for last May. From this source are obtained the following facts relative to the electrical exports for that month.

May continued the strong advance movement in electrical shipments and established another new record, its total eclipsing the records successively established in March and April. The total electrical exports for the 11 months ended May 31 amount to $24,458,084 or about 33 per cent in excess of the corresponding months of the preceding fiscal year.

The classified figures and total for last May are given below, together with the corresponding total of May, 1912.

Articles	No.	Value
Dynamos or generators		$ 222,398
Motors		357,645
Fans	3,676	40,394
Arc lamps	1,388	22,817
Carbon-filament lamps	181,839	31,653
Metal-filament lamps	101,407	33,160
Telegraph instruments (including wireless)		8,615
Telephones		198,579
All other		1,643,626
Total, May, 1913		$2,558,887
Total, May, 1912		$2,068,346

An international exposition of the lighting industry is to be held next month (August) in Alexander Park in Praga, a suburb of Warsaw, Russia. Its object will be to demonstrate modern methods of lighting, their advantages and cost.

Large Mexican Project Completed.

The beginning of this month witnessed the completion of one of the largest electrical developments upon this continent—that of the Mexican Light & Power Company. At a cost of approximately $80,000,000, this company has just finished at Necaxa, situated about 110 miles from Mexico City, two hydroelectric plants, having an aggregate capacity of 127,500 horsepower, and constructed an extensive system of power-transmission lines. Besides these two main power stations, the company has installed auxiliary hydroelectric plants at Texcapa, Laguna, Irrigador and San Ildefonso, all of which are embraced in the general Necaxa power scheme. These three last mentioned plants have an aggregate capacity of 21,400 horsepower, making a total of 148,900 horsepower that the company has available.

The works at Necaxa are said to be a remarkable engineering achievement. In order to provide an ample supply of water a series of huge storage reservoirs were built. The last of the series has just been finished and has a capacity of six million cubic feet of water. The aggregate storage capacity of the reservoirs is sufficient to keep the hydroelectric plants in constant operation for six months without any rainfall.

Leading from the great power stations are transmission lines that run to Mexico City, to El Oro, to Puebla and other cities and industrial centers. The line to El Oro is about 172 miles long, with a voltage of 85,000.

Besides furnishing the electric lights and power for Mexico City, the company provides the energy for operating the extensive traction system throughout the Federal District, the car lines being owned by a subsidiary concern.

The Mexican Light & Power Company began work on its great hydroelectric project about ten years ago. It carried the construction operations on steadily and with only slight interruptions during the long period of revolutions through which the country is passing. During the last three years there has been hardly a time when less than 6,000 laborers were employed on the works at Necaxa. Occasionally roving bands of rebels have cut cables, but no serious interferences have been met with.

The syndicate of Britishers who comprise the Mexican Light & Power Company and its subsidiaries is sometimes designated as the Pearson syndicate, F. S. Pearson being at its head.

Improvements in Street-Lighting Service.

Street-lighting service on the series system is so well standardized for both arc lamps and tungsten incandescent equipment that opportunities for improving distribution arrangements are not always realized by municipalities and operating companies. The tendency of central-station service to extend beyond the limits of a single town, however, introduces new elements into the problems of providing for economical and reliable street lighting over large areas, and one of these is the provision of suitable safeguards against double interruption within municipal boundaries in cases where a company in one town supplies the lighting for the highways of another in addition to its own.

This very particular problem has been solved in a typical case by installing remote-controlled oil switches in a metering house at the town boundary, the connections being arranged so that if an interruption occurs on the lines most distant from the generating plant, these lines will be automatically cut off from the station without interfering with the service rendered on the street-lighting circuits in the intermediate territory between the municipal boundary and the generating plant. The local circuits in the town, on the other hand, are automatically freed from connection with the main system in case of any serious trouble on the street-lighting lines of the latter, and while this temporarily disconnects the lights in the outside town, it is only necessary to throw over an emergency switch in the meter house at the boundary to supply the local lamps from the regular alternating-current feeders of the main system, through a constant-current transformer located in the meter house. In normal operation the oil switches are cut in and out from a distance of over two miles by a small motor and auxiliary contacts, and the arrangement has saved labor and given reliable service throughout a considerable period.

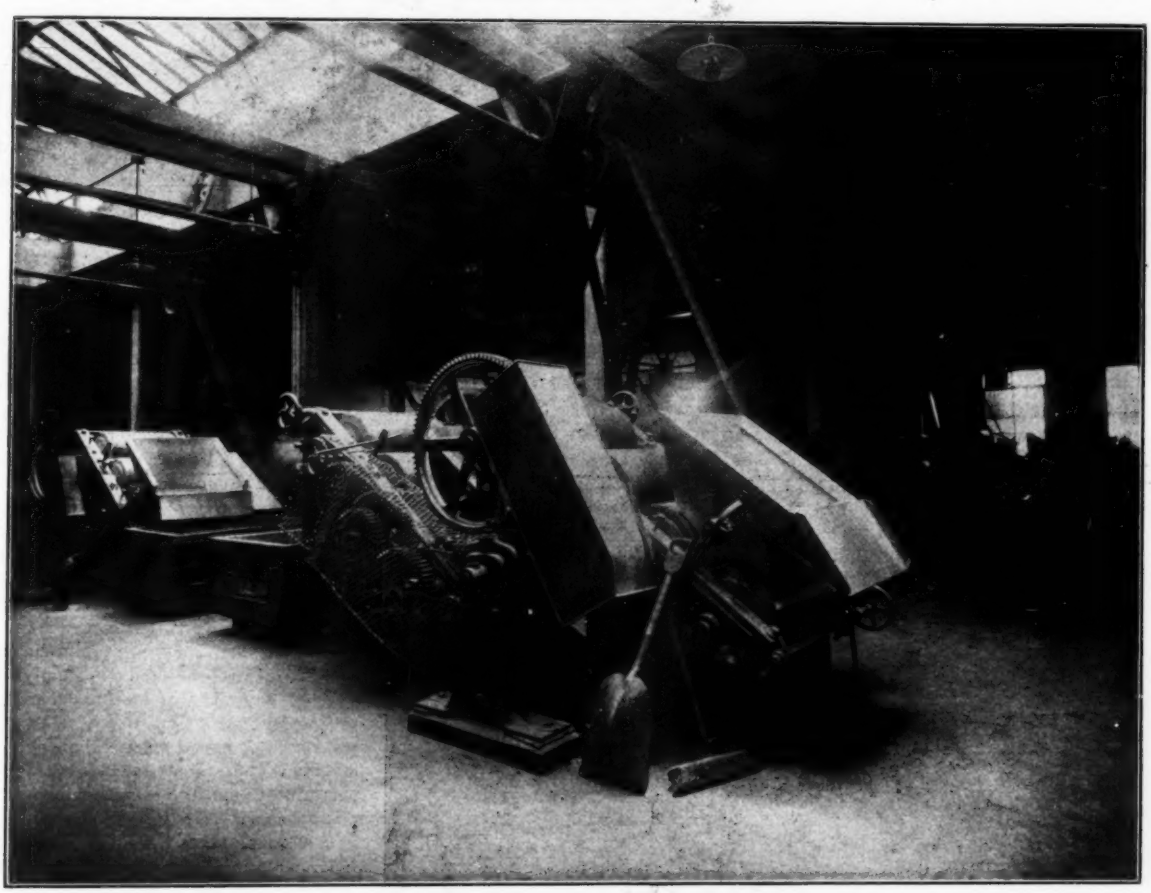
Long Submarine Telephone Cable Laid Near Vancouver.

A 35-mile cable for telephone connections between Vancouver and Vancouver Island, B. C., has been laid. It was made in England. It cost over $100,000, weighs 560,000 pounds, and the expense in laying was $20,000. It is said to be the longest telephone cable in the world, and is laid at a depth heretofore not attempted, much of the line going 200 fathoms deep in the Gulf of Georgia, at one place being 1,356 feet deep. By the middle of July a cable will be stretched across Saanich Inlet, which will bring Victoria into much better connections with Vancouver by means of the cable just laid.

Electricity in Soap Manufacturing.

An analysis of operating conditions and power costs in a typical steam-driven soap factory indicated that a substantial saving could be made by adopting central-station service. This is borne out by conditions in many plants. Data on selection of proper motors, advantages of motor drive, etc., are given in this article.

Although steam, in large quantities, is used in manufacturing soap there are a number of plants that are finding it profitable to purchase power from central-station companies because of the inherent advantages of motor drive and the reliability, convenience and flexibility of purchased power. There has been apparent, however, a reluctance on the part of central-station companies to enter this field because of the fact that steam is required in soap manufacturing and to an erroneous idea that, save in a few isolated cases, the cost of central-station power could not be made sufficiently attractive. On the other hand where power solicitors have approached factory managers the latter have, in a majority of cases ignored the arguments presented, due principally to a mistaken conception as to the true power and steam costs in their plants.



Group of Soap Mills Driven by a 25-Horsepower Motor.

Experiences of central stations in a number of cities have demonstrated, nevertheless, that, while the business of soap factories is difficult and at times impossible to secure, central-station power can in many instances effect savings.

A modern soap factory affords many opportunities for the profitable introduction of electricity as a power distributing and lighting medium. Few industries have need for so many comparatively small amounts of power applied in widely separated departments as does a large soap factory. In meeting these conditions electricity is being employed and is an ideal means of transmission. It is clean, simple, positive and flexible, allowing extensions and additions to be made to the various buildings or the construction of new departments extending over a wide area; it makes power application in such developments possible at low cost for transmission system and increases greatly the efficiency of the whole establishment.

In soliciting the adoption of electric drive for soap factories, a great proportion of success depends upon the ability on the part of the central-station salesman to correctly analyze existing plant-operating expenses and fixed charges. Ability to do this readily and correctly will go far to demonstrate definitely and convincingly to a prospect the flaws and waste and general field for improvement in his power layout.

As heat as well as mechanical power is required for the complete cycle of operations in soap factories, in determining the relative merits and economies of various systems of drive it is commonly held that the additional coal for sustaining sufficient boiler pressure to operate the engine is negligible when

compared with the fuel needed solely to obtain steam for cooking. The engine is therefore considered to perform the functions of a cheap and effective "reducing valve" between boiler and heating systems, practically generating at no cost the mechanical power required.

Live steam is required for cooking the soap, hence practically all of the total steam generated must be delivered at boiler pressure. In determining the thermal value of the exhaust from a low-pressure engine due consideration must be given such variables as initial gauge pressure, and point of engine cut-off, also taking into consideration radiation losses and leaks in main piping, engine cylinder, etc.

Mechanical transmission requiring long lines of shafting, innumerable belts of all sizes and other mechanical appliances, the continuous operation of which, for the delivery of small quantities of power at points remotely located with relation to the main engine room, or long lines of steam piping for the delivery of steam into engines located in the outlying departments, are sources of constant loss, continuing throughout all hours of operation.

Combined Soap Dryer and Mill Driven by 10-Horsepower Motor.

Selection of Motors.

The selection of motors for drive in soap factories presents no especial difficulty. Where alternating current is available, the polyphase induction motor with squirrel-cage windings is, of course, preferred. This motor is extremely simple and may therefore be built to withstand hard usage and to run continuously in exposed locations and under disadvantageous conditions. The high efficiency obtained in this motor over wide load ranges and the minimum amount of attention it requires while running, make it compare favorably in cost of operation with motors of any other type. In the case of soap-power grinders, etc., the slip-ring motor should be specified due to the heavy starting torque of these motors. Compound-wound motors should be used where the supply source is direct current. In tank rooms, mixing rooms and other locations where the motors would be subjected to dampness, acids, etc., it is found desirable to suspend them from the ceiling. This method of installation also has the advantage of economizing on space.

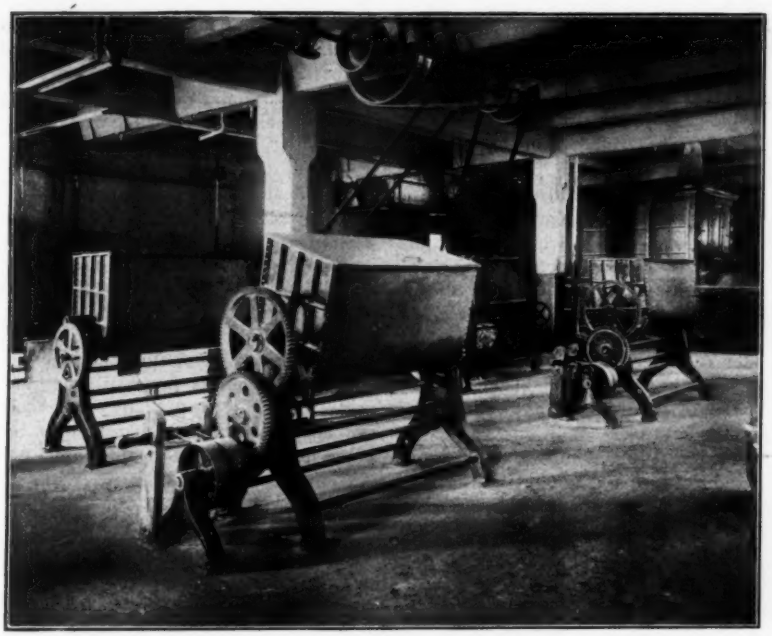
Soap Plodder Driven by 15-Horsepower Motor.

Comparative Costs.

Conditions as regards steam versus electric operation are admirably illustrated in the case of a soap factory located in the Middle West, which until recently had been using engine drive, with a small electric generator for supplying energy for operating elevator motors. The power equipment under the old conditions comprised a 150-horsepower fire-tube boiler, operating at 95 pounds pressure, for supplying steam for the soap vats and a 12 by 30-inch 50-horsepower Corliss engine, running at 75 revolutions per minute. A 17-kilowatt 250-volt direct-current generator was installed to supply energy to two elevator motors located in the warehouse. One of these motors was a 7.5-horsepower shunt-wound machine operating at 825 revolutions per minute; and the other a four-horsepower special elevator motor running at 800 revolutions per minute.

Power for driving the various machines in the factory was transmitted by an extensive system of belts and line shafts. The line shafting consisted of approximately 250 lineal feet, and was supported by 40 hangers.

During a day when all of the machines were running normally except the soap mixer and two oil mixers, the engine was indicated for a period of 1.5 hours, and the average horsepower shown by the cards was 25.34. A set of cards was also taken with all of the machines idle. From these the frictional load was calculated and found to be 12.63 indicated horsepower. This included the engine friction and that of the belts and shafting. It was



Group of Soap Mixers Driven by 15-Horsepower Motor.

demonstrated to the manager of the plant by the central-station engineer that the difference between 25.34 and 12.63 viz. 12.71 is the average horsepower consumed by the machines alone. The engine friction was estimated to be approximately 7.5 horsepower. This leaves 5.13 horsepower as a loss in shaft and belt friction. By the use of motors at least half of this shaft and belt friction loss was eliminated. The average power then required to drive the machines was 12.71 and 2.57 or 15.28 horsepower. This amounts to 152.8 horsepower per day or 45,840 horsepower-hours per year.

These figures were computed without considering the oil mixers, each of which require approximately two horsepower to drive. The average time of operation of these machines is one-half hour per week for one and three hours per week for the other. This amounts to an annual use of two horsepower for 182 hours or 364 horsepower-hours. The soap mixer which also was idle when the engine was indicated operates about 350 hours per year. As it requires five horsepower to operate, the annual energy consumption is 1,750 horsepower-hours.

The brake horsepower-hour consumption per year, therefore, is 45,840 plus 364 plus 1,750 or 47,954. Allowing a motor efficiency of 85 per cent, the total energy required per year is 56,416 horsepower-hours or 42,312 kilowatt-hours.

Since the amount of steam used in the soap vats in this factory, and for purposes other than running the engine is extensive it was difficult to estimate from the operating expense account the true cost of power. However, from the power requirements as shown by the central-station company's tests the following conclusions were drawn.

The average indicated horsepower of the engine was found to be 25.34. This amounts to 76,020 horsepower-hours per year. Adding to this amount the 2,114 horsepower-hours per year required to drive the soap and oil mixers gave 78,134 indicated horsepower-hours. At this low average load the engine required approximately 45 pounds of steam per indicated horsepower. The annual steam consumption was, therefore, 3,516,030 pounds. With the conditions under which the plant was operating, the boiler evaporated approximately 6.5 pounds of water per pound of coal burned. The annual coal consumption was, therefore, 540,928 pounds or 270.48 tons which at a cost of $3.00 per ton amounted to $811.38.

Tabulated costs were found to be as follows:

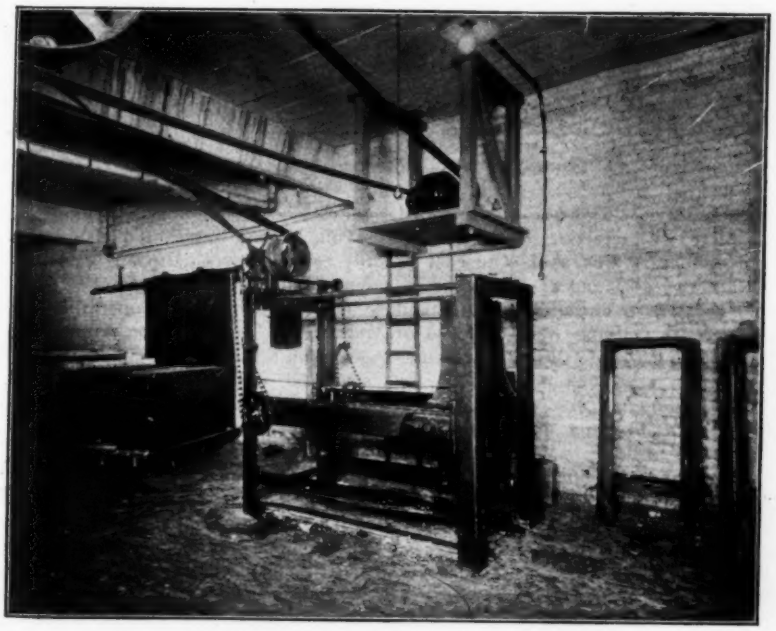
Coal, 270.48 tons at $3.00	$ 811.38
Labor, one engineer and fireman	720.00
Cylinder oil, 1.5 pints per day	16.88
Engine oil, one quart per day	11.25
Waste, packing, and small supplies	25.00
Purchase power for lighting	523.49
Total	$2,108.

The rates for electric energy which the central station made to the factory were as follows:

Six cents per kilowatt-hour for the first 200 kilowatt-hours used during any month; five cents per kilowatt-hour for the second 200 units; four cents for the third 200, and three cents for all energy in excess of 600 kilowatt-hours used during any month. On each monthly bill a discount of five per cent is made on the first $25 and one per cent on amounts in excess of $25. These rates applied to the consumption of the factory in question, with discounts, give an average net cost per year for central-station power of $1,712.71. The annual saving in power costs, exclusively, is therefore $385.29.

The factory, of course, took advantage of this opportunity to reduce operating expenses and the following motor equipment was installed:

One 10-horsepower motor running at 1,200 revolutions per minute was in-



Five-Horsepower Motor Driving a Soap Slabber.

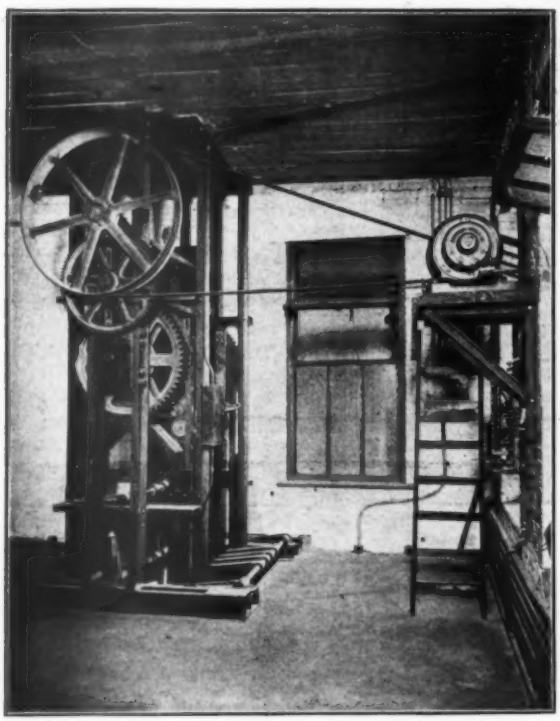
stalled for driving one freight elevator and one soap chipper.

One 15-horsepower motor running at 1,200 revolutions per minute was installed for driving one 36-inch exhaust fan; one 48-inch exhaust fan, one rotary stuff pump and one soap mixer.

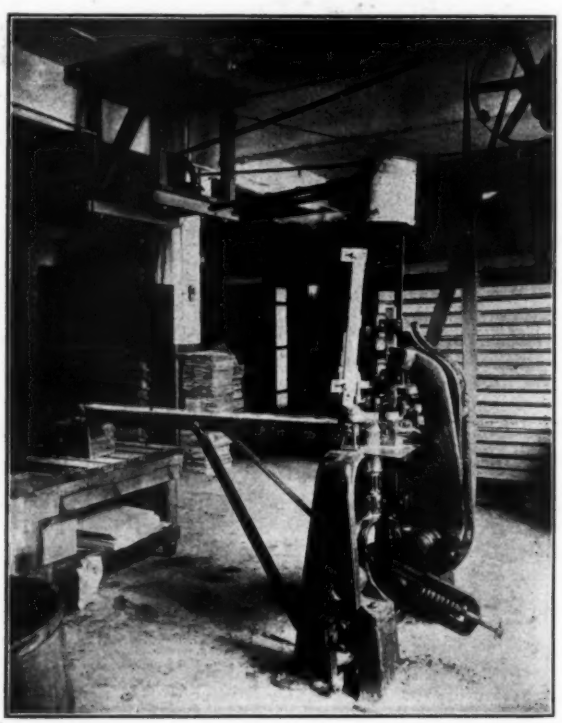
One five-horsepower motor running at 1,200 revolutions per minute is belted direct to a large drying fan.

One 75-horsepower motor running at 900 revolutions per minute drives a freight elevator, and two oil mixing machines.

The two direct-current elevator motors driving the warehouse elevators were replaced by two five-horsepower three-phase 60-cycle motors running at a speed of 900 revolutions per minute.



Motor Driving Box Elevator.



Motor Driving Soap Press.

The total cost of the motors installed complete with starting switches, pulleys and bases was $945. The cost of wiring was $325 and the labor necessary cost $100. The old generator and two elevator motors were disposed of for $250 which made the total cash outlay for the new equipment $1,120.

The saving in power costs shown in this case, as in many similar instances, was found to be really but a small part of the total saving effected over the old method of operation. After several months operation it was found that the production of the plant had increased 12 per cent without increasing the number of machines or the hours of operation. The better lighting and ventilation resulting from the removal of belts and shafting and the flexibility of motor drive which permitted the various machines to be located with respect to sequence of operations, etc., are points which this manufacturer now considers of greater importance than reduced cost.

These advantages also apply with equal force to soap plants in general. However, the saving which can be effected by the use of electricity for power purposes varies greatly with different plants and depends, of course, on the size and arrangement of the plant under consideration. A thorough canvass of the establishment should be made and the present as well as the possible future conditions carefully weighed. Any comparison of economies should embrace not only the saving in fuel but should also include the relative costs of repairs and maintenance for the two systems.

Of the plants now operating with mechanical transmission, the larger ones and those most complex or widely scattered would naturally derive the greatest benefit by adopting central-station power. In such plants, the transmission is usually more complicated, changing floor loads make it more difficult to keep shafting in line, while developing conditions make frequent modifications and extensions to the transmission equipment necessary. To save time and expense, these changes are often knowingly made, not in a manner to get the most economical results, but in a way that will do for the time and avoid interruptions to business.

It is a common occurrence that not all the departments of such a plant are operated continuously or simultaneously, therefore, in plants using mechanical drive it is necessary to operate the entire engine equipment if it is only desired to run one or two machines. A carefully determined and suitable arrangement of electric motors permits any or all departments to be operated at will, without the loss due to operating needless transmission equipment.

In a prosperous concern some departments develop, perhaps even reaching such proportions that it may become necessary to re-locate them. Another department shrinks or may be found to occupy space which could be used to better advantage for some other purpose. It is often found awkward to arrange anything like a good and economical plan for distributing power with shafting and belting, and departments are frequently, therefore, necessarily kept in awkward relations on this account, it being too expensive to re-locate them. With mechanical transmission it sometimes happens that the location of the power plant is a compromise or makeshift arrangement, brought about by the necessity of getting at the main lines of shafting. It may occupy space which could and naturally would be used to good advantage for productive purposes.

Soap Manufacturing Data—Sheet No. 1.

The term load-factor is used in these data in such a sense that a load-factor of 100 per cent represents the use for 24 hours every day of power corresponding to the rated capacity of the motors connected. An operating-time load-factor of 100 per cent represents the use of the rated capacity of the motors for the running hours per day specified for each installation.

Soap factory manufacturing toilet soaps exclusively. Plant operates 54 hours per week.

Total connected horsepower, 20. Total number of motors installed, one. Average kilowatt-hours per month, 1,125.

Kilowatt-hour consumption for 12 months:

Month	Kilowatt-hours	Month	Kilowatt-hours	Month	Kilowatt-hours
January	814	May	1,897	September	1,893
February	665	June	1,717	October	1,707
March	354	July	282	November	1,606
April	758	August	522	December	1,297

Load-factor, 10.3 per cent; operating-time load-factor, 24 per cent.

MOTOR INSTALLATION.

The following is a record of the motor installation at this plant. The supply source is three-phase, 60 cycles, 220 volts.

No.	Horse-power.	Speed R. P. M.	Application.
1	20	1,200	Belted to a line shaft driving one three-pound carton filler; one 2,000-pound freight elevator; one No. 14 Blanchard soap-powder mill; and one shaking screen.

Soap factory manufacturing toilet and laundry soaps of various grades.

Total connected horsepower, 62.5. Total number of motors installed, 14. Average kilowatt-hours per month, 3,546.

Kilowatt-hours consumption for 12 months:

Month	Kilowatt-hours	Month	Kilowatt-hours	Month	Kilowatt-hours
January	2,970	May	4,890	September	3,040
February	3,900	June	4,310	October	2,180
March	3,970	July	3,600	November	3,010
April	4,000	August	3,880	December	2,810

Load-factor, 10.4 per cent.

MOTOR INSTALLATION.

The following is a list of the motors installed with their respective drives. The supply source is three-phase, 60 cycles, 220 volts.

No.	Horse-power.	Speed R. P. M.	Application.
1	5	1,200	Belted direct to air compressor.
1	5	1,200	Belted to an air beater for mixing soap in cooking vats.
1	15	900	Belted direct to one soap crutcher.
1	5	1,120	Belted to an automatic machine for boxing and sealing soap power in cartons.
1	1	1,200	Belted direct to soap chipper.
1	2	1,120	Belted direct to 18-inch drying fan.
1	10	1,120	Belted direct to one scoring machine (sand-soap mixer).
1	1	1,200	Belted direct to one slabber.
1	1	1,200	Belted to box conveyor.
1	2	1,200	Belted direct to one box-nailing machine.
1	0.5	1,200	Belted direct to one automatic soap-wrapping machine.
2	5	1,200	Each driving freight elevator .
1	5	1,650	Belted direct to a Cottrell press.

Soap factory making laundry and toilet soaps and perfumes.

Total connected horsepower, 47.5. Total number of motors installed, 6. Average kilowatt-hours per month, 2,336.

Kilowatt-hour consumption for 12 months.

Month	Kilowatt-hours	Month	Kilowatt-hours	Month	Kilowatt-hours
January	2,430	May	2,460	September	2,380
February	2,060	June	2,130	October	2,460
March	1,610	July	2,180	November	2,830
April	2,330	August	2,270	December	2,890

Load-factor, 9 per cent.

MOTOR INSTALLATION.

The following is a list of the motors installed with their respective drives. The supply source is three-phase, 60 cycles, 220 volts.

No.	Horse-power.	Speed R. P. M.	Application.
1	10	1,200	Belted to a line shaft driving one freight elevator; and one soap chipper.
1	15	1,200	Belted to a line shaft driving one 36-inch exhaust fan; one 48-inch exhaust fan; one rotary pump: and one soap mixer.
1	5	1,200	Belted direct to one large drying fan.
1	7.5	900	Belted to line shaft driving one elevator; and two oil mixers.
2	5	900	Each driving elevator mechanism.

Soap Manufacturing Data—Sheet No. 2.

Soap factory manufacturing a complete line of laundry and toilet soaps, soap powder for commercial laundries and public institutions and cleaning powders. The tank capacity of the plant is 1,000,000 pounds per week but the actual output averages 1,250,000 pounds. There are two shifts of employees working eight hours each.

Total connected horsepower, 632. Total number of motors installed, 39. Average kilowatt-hours per month, 36,000.

Kilowatt-hour consumption for 12 months:

Month	Kilowatt-hours	Month	Kilowatt-hours	Month	Kilowatt-hours
January	30,700	May	54,600	September	24,500
February	32,200	June	37,100	October	38,700
March	39,800	July	24,600	November	48,500
April	41,700	August	25,800	December	34,500

Load-factor, 10.5 per cent; operating-time load-factor, 13 per cent.

MOTOR INSTALLATION.

The following is a list of the motors installed in this plant with their respective drives. The supply source is two-phase, 60 cycles, 220 volts and 500 volts, direct current. All alternating-current motors are of the squirrel-cage induction type.

No.	Horse-power.	Speed R. P. M.	Application.
1	5	1,030	Direct-current motor belted direct to a box elevator.
1	2	1,800	Belted direct to a box conveyor, 75 feet long, 60 degree angle, used for conveying empty boxes to packing department.
1	1	1,800	Geared to Sheridan paper cutter in printing department.
3	1	1,200	Direct-current motors each belted direct to a job printing press.
2	0.5	1,700	Direct-current motors each belted direct to a job printing press.
2	28	....	Special direct-current elevator motor each driving freight elevator.
1	5	1,120	Belted direct to circular saw in packing department.
1	25	775	Belted to a 60-foot line shaft, 10 hangers, driving six soap plodders, manufactured by the Clyde Machine Works.
1	100	500	Belted to a 50-foot line shaft, 10 hangers, driving six Rutschhan Brothers three-roller soap mills; and four soap mixers for mixing coloring and perfume with soap.
4	10	880	Each motor geared direct to a Cressonnieres soap mill and drying machine.
1	50	600	Belted to a 40-foot line shaft, eight hangers, driving four 70-inch Sturtevant drying fans, one for each of the above machines.
1	15	840	Belted direct to one "Proctor System" soap mill and dryer, manufactured by the Philadelphia Textile Machinery Company.
1	10	880	Belted direct to one "Proctor System" soap mill and dryer, manufactured by the Philadelphia Textile Machinery Company.
1	10	880	Belted to fan system of above machine.
1	25	775	Belted to a 20-foot line shaft, six hangers, driving two agitators for mixing fuller's earth with oils.
1	10	880	Belted to eight-foot line shaft, four hangers, driving two soap crutches for mixing.
1	75	800	Belted to a 40-foot line shaft, 10 hangers, driving one Sturtevant No. 10 ventilating fan; and four soap crutchers.
1	15	1,120	Belted to a 20-foot line shaft, five hangers, driving two punch presses for tin covers of soap-powder boxes; and two spiral machines for making cylindrical boxes.
1	3	1,200	Belted direct to one R. A. Jone & Company soap press.
1	10	415	Direct-connected to a New York Blower Company fan for soap drying. Dry room 50 by 70 by 10 feet.
1	5	1,030	Belted to a countershaft driving soap slabber for cutting cakes into slabs.
1	22	275	Direct-connected to a 110-inch drying fan.
1	25	990	Belted to an 18-foot line shaft, four hangers, driving four soap crutchers.
1	10	880	Belted to an eight-foot line shaft, three hangers, driving one slabber; and one cutting table.
1	15	840	Belted direct to New York Blower Company drying fan.
1	5	1,200	Belted to a 10-foot line shaft, three hangers driving one soap press; and one automatic wrapping machine.
1	5	1,200	Belted to a line shaft driving one conveyor conveying soap from presses to wrapping table; and one automatic wrapping machine.
1	10	1,120	Belted to an automatic machine for weighing, filling and sealing packages of soap powder.
	10	1,200	Belted to a line shaft driving four can crimpers.
1	5	1,120	Belted direct to one soap-powder machine.
1	10	900	Belted direct to one soda ash grinder.
1	50	600	Belted to a line shaft driving two soap-powder grinders.

Commercial Practice
Management, Rates, New Business

Pulmotor for Drowning Accidents.

In line with its policy of establishing friendly relations with the public, as well as to perform a worthy public service, the Toronto Electric Light Company has announced through local papers that it desires citizens of Toronto to call for the company's pulmotor in drowning accidents.

A recent advertisement makes the following statement in regards to the matter.

"In order to make available over the largest possible territory the use of its free pulmotor service, The Toronto Electric Light Company, Limited, has secured the co-operation of Captain Ward, in command of the Government Life-saving Station at Ward's Island, and Mait Aykroyd, the well-known life-saver at the foot of York Street.

"Many persons apparently drowned have been revived by the pulmotor when all other means of resuscitation have failed. A large number of the company's men has been trained in the use of the pulmotor by The Toronto Electric Light Company, Limited and two or more are always on duty at the company's station at the foot of Scott Street. The telephone call for Scott Street is Adelaide 404.

"The police and the public are urged to call for the pulmotor immediately and not try to do without it. The pulmotor is perfectly capable of resuscitating drowned persons if life is not extinct, but it cannot restore life. The quicker it is put to work, the better is the chance of saving life.

"The rapidity with which the pulmotor may be obtained was illustrated only the other day. A drowning accident occurred at Centre Island and some one telephoned to Captain Ward. He at once started for the Scott Street Station of The Toronto Electric Light Company Limited, in his fast motorboat, while one of his crew at the life-saving station telephoned to Scott Street that he was on the way and to have the pulmotor with its crew ready to meet him. In three minutes Captain Ward was at the Scott Street dock, had picked up the pulmotor and the company's men, and was on his way to Center Island, which was reached in nine minutes.

"It has also been arranged to send the pulmotor in a automobile to meet Captain Ward where time can be saved in so doing.

"The public and police are urged to report drownings immediately to Captain Ward or Mait Aykroyd. They will give the requisite orders to the pulmotor crew at Scott Street and assume command of the situation in person".

Vancouver Central Station Opens Truck Garage.

The British Columbia Electric Railway Company, Limited, has recently advanced the prospects of the electric vehicle business in Vancouver by opening a fully equipped garage for this type of equipment.

The chief object of the company in arranging for this garage is to accommodate the demands of owners of commercial trucks, the sale of which the company is now pressing vigorously. It is the intention to leave the business of caring for electric pleasure cars to the owners of private garages, a number of these establishments in Vancouver being equipped for this purpose.

The garage is located in the heart of the business district, thus being convenient for the firms operating electric trucks. The floor space for the vehicles is 90 by 170 feet, which will permit of the accommodation of from 50 to 60 cars, according to size. Located to advantage on the ground floor are the offices of the superintendent of the station and another compartment for battery room and workshop. On the upper floor is a large room for storage, where spare parts, etc., are kept.

The electrical equipment consists of a direct-current motor-generator set of 75-kilowatts capacity, with an emergency set consisting of a 50-horsepower motor belted to a 45-kilowatt generator. A complete switchboard apparatus and necessary equipment for charging is also provided. All the charging lines are laid in conduit under the cement floors.

At the present time about 15 cars are taken care of at the garage. The service given consists of the storage of the car, daily washing and oiling, charging of batteries as needed (this work being done, as usual, at night, although the firms are urged to have their men look after their cars and have the batteries "boosted" at noon if there is need) and the making of minor adjustments and repairs. The force now employed at the garage consists of a superintendent, three operators and a washer. The rates charged for the services noted above are as follows:—

	Per month.
Cars 750 and 1,000 pounds	$45
1 ton trucks	55
2 ton trucks	60
3½ ton trucks	65
5 ton trucks	70

The usual charge for the keep of electrical pleasure cars at Vancouver garages is from $30 to $35 per month, the garages sometimes offering in connection with the services the calling for and delivery of the cars.

The Vancouver company has done good missionary work in the introduction of electric commercial trucks in Vancouver. As soon as it was decided to take up an agency an experienced man was engaged who was acquainted with both the selling and garage ends of the business. An advertising campaign was conducted through the daily press, circular letters, pages in auto magazines, etc., which aroused keen interest in the business. As the firm operates a number of electric trucks in its own business, the "prospect" was usually given the opportunity of testing out a car in a day's work at his particular form of business, this form of canvassing being very telling in results. Since spring, two hotel buses have been sold, each of one ton, a two-ton truck to a wholesale fruit firm, a two-ton truck to a wholesale hardware firm, a one-ton truck to another hardware firm, and three trucks, ranging from 750 pounds to 3.5 tons have been taken by the company for its own business. Through other dealers another two-ton truck has been secured by a wholesale milling firm which made the purchase after a year's trial of an electrical truck at another point on the coast. The company's representative reports that keen interest is being taken in the operation of electric trucks and that his "prospects" are numerous, the indication being that a good business will be done in the near future.

Elkhart Plant Increases Capacity.

The capacity of the power station of the Indiana & Michigan Electric Company, at Elkhart, Ind., has been increased by 1,800 horsepower. This capacity was created by damming the St. Joseph River and installing hydraulic turbines. The previous capacity was 1,200 horsepower.

Value of a Small Water-Power Privilege.

An engineer of a hydroelectric power company estimated the value of water privilege that had been acquired along a river in an Eastern state in the following manner. The drainage area consisting of 42 square miles was found by tracing the outline of the watershed by a planimeter on a United States survey map, and a fall of 12 feet was measured along the river by an engineer's level. The rates of flow per square mile for the different months was based on the stream measurements of a neighboring river as there were no flow data available. The accompanying table gives the flow in cubic feet per minute for the months in the order of their dryness, and the net horsepower for the corresponding flow.

The net horsepower was taken at 0.8 of the theoretical amount.

Months.	Cu. ft. per Minute.	Horsepower.
July	4,800	88
September	4,800	88
August	6,000	110
October	10,300	190
June	10,300	190
November	16,300	300
May	20,700	380
December	22,300	410
January	24,000	440
February	32,700	600
April	38,200	700
March	58,200	1,067

In determining the permanent horsepower, account was taken of the fact that a large storage tract located above the privilege holds back the extreme high water and increases the low-water flow, as was emphasized by the government engineers in a description of the river, resulting in a more steady flow than is characterized in other rivers in the same territory. Consequently it was estimated that instead of 88 horsepower there could be developed 100 permanent horsepower for 24 hours in a day and 12 months of the year, 200 horsepower for nine months, 300 horsepower for seven months, 400 horsepower for five months and 500 horsepower for three months.

The value of the water, in proportion to the amount of time which it will run during the year, using as a basis 100 horsepower at the rate of $50 a horsepower per year for the 24-hour power, is summarized in the following table:

$5,000 for the rental value of 100 horsepower for 12 months.
$3,750 for the rental value of the next 100 horsepower for 9 months.
$2,916 for the rental value of the next 100 horsepower for 7 months.
$2,067 for the rental value of the next 100 horsepower for 5 months.
$1,250 for the rental value of the next 100 horsepower for 3 months.

$14,983, say $15,000.

The capitalization of $15,000 at 6 per cent equals $250,000 which is the value of the operated power.

Copper Exports.

Exports of copper for the month of June totaled 7,815 tons, as compared with 26,547 tons during the same month last year.

Extension of Transvaal Power Plants.

The Victoria Falls & Transvaal Power Company, and the Rand Mines Power Supply Company, which supply electrical energy and compressed air to an extensive network in the South African mining district, are increasing their several power plants as follows: Simmer Pan station, two 11,000-kilowatt turbogenerators; Vereeniging station, two 12,000-kilowatt turbogenerators; Rosherville station, three 7,000-kilowatt steam-turbine-driven air compressors. With these additions the five plants of this combined power system will have a total capacity of 140,000 kilowatts in electrical generating machinery and 61,500 kilowatts in air-compressing equipment. Further early additions are also contemplated to the Brak Pan station to meet the increasing demands of the extensive gold fields in that district.

Lighting-Rate War in Madrid.

In Madrid, the capital of Spain, the cost of electric lighting owing to the ruinous competition between the various electric-lighting companies, is less than ever before. The new Campania Cooperativa Electrica Madrid, deriving its power from a hydroelectric plant 150 miles from Madrid, has by its entrance into the city forced down the price of electric current from 18 cents per kilowatt-hour in 1911 to 3 cents in the latter part of 1912. As a consequence no company is making its expenses, but the new company is in the best financial condition. An agreement is being arranged between the companies interested by which the price of current will be raised to 7 cents per kilowatt-hour, the maximum price that can be charged by the new company under its contract with the city.

Fan Equipment for Campaign Car.

A wagon which recently conveyed a number of campaign orators over the west end of Louisville, Ky., was well equipped to stand the heat. It had a 16-inch oscillating fan which had a cord long enough to enable a connection to be made with a nearby store, while the same source was used to provide current for a number of lamps set in a frame which helped to illuminate the wagon and its passengers.

The electrical outfit of the campaigners was sufficiently novel to attract more than passing attention, and they attracted a larger crowd than the heat warranted them in expecting.

Extensive Electrical Lecturing by Boston Edison Company.

The lecture division of the advertising department of the Boston Edison Company has given more than 35 lectures in eastern Massachusetts on various electrical subjects. Men's and women's clubs, children's classes, and church societies and lodges have been the objective points. Over 4,000 people have been reached by this educational campaign, which has been under the supervision of L. D. Gibbs, superintendent of advertising for the company, assisted by La Rue Vredenburgh and F. C. Hard.

Demonstrations of electric cooking and heating are given in conjunction with the lecture service. The entire equipment, which comprises kitchen table of the "knock down" type, appliances, dishes, and other paraphernalia, is so designed that it can be quickly shipped to the scene of the lecture and exhibition.

Keokuk Power Used in St. Louis.

On July 1 the Mississippi River Power Company began supplying power from its hydroelectric development at Keokuk to the city of St. Louis.

Ten generating units have now been installed at the Keokuk power station and current is being supplied to a number of surrounding towns, including Keokuk, Iowa, and Hamilton and Warsaw, Ill.

Exhausting Gases in a Garage.

Most central-station salesmen are familiar with the deadly effect of the dust from various industrial processes when it is steadily breathed into the lungs of workmen. All forms of electric exhaust blowers have been used to relieve such conditions. One field, however, which has to date been sadly neglected, is ready at hand in the automobile garages and repair shops, where exhaust gases emitted under certain conditions of incomplete combustion due to improper mixing of gas and air in carburetors contain a proportion of carbon monoxide gas which is very deadly yet so subtle as to be hardly noticed even by an experienced gas worker.

The most effective method is to run a line of pipe similar to a shaving exhaust in a woodworking plant only of smaller size, and at the outlet install an ordinary forge blowing outfit to give velocity to the exhaust when machines are run slowly and to clear the pipe after the machine is away from connection. Ordinarily the momentum given to the gases from the engines will render the current consumption small indeed.

This plan is used in many factories on the test floors but the garages and dealers need some coaching, and as a starter the central-station salesmen should take it up.

Electrical Construction

ELECTRICAL EQUIPMENT OF THE PACIFIC MILLS NEW PRINT WORKS DEPARTMENT.[1]

Lighting and Signal System.

By Theodore A. Bergen.[2]

Bleachery and Dye-House Wiring. As mentioned previously, the entire first floor of the central building is assigned to processes for bleaching and dyeing. In a place of this kind, where excessive moisture, and, above all, caustic vapors and fluids predominate, extraordinary measures must be taken to protect the electric wiring. All who have had experience with this class of work know that it is next to impossible to maintain an ordinary system of wiring, for any length of time in a place of this kind, no matter how well planned and conscientiously installed. The gases and fluids are so ruinous to ordinary wire and fittings that a complete re-wiring of the entire installation after only a year or two is the usual course of events. Therefore considerable study was given this subject for the installation under consideration.. It was a question of whether to install a cheap system with a view to having to replace it after a few years, or to disregard first cost and adopt something that would last indefinitely. It was finally decided to follow the latter alternative, and on this basis the system of wiring, which will be described in the following, was worked out.

Both the basement and the first floor of the central building are exposed to the caustic vapors and fluids mentioned above, the first floor because all the processes which create them take place there, and the basement because the floor of the room above consists of planks with from one-quarter to one-half-inch openings between them, allowing the water and acids to run through to the basement, where they are collected and carried off through an elaborate draining system. Such being the case, the conditions in the basement were fully as severe as those in the story above. It was therefore decided that these two floors should be treated similarly. Since no manufacturing is done in the basement, comparatively little light was needed there, and smaller lamp units could be used than on the first floor. Also, owing to the fact that the ceiling here was wood, while in the first story it was concrete, it was necessary to employ slightly different methods in the two places.

The wiring for the basement was installed as follows. All wiring was done with twin-conductor, rubber-insulated, lead-covered cable, mounted on single-wire, porcelain cleats. Screws for securing cleats are brass with round heads. All wires are bent around the beams. From the cabinets all wires (in no case more than four) run in one conduit to a junction box installed at the ceiling immediately above each cabinet. From this box the different cables are run open to the different outlets as mentioned above. At each outlet and junction point is installed an ordinary Bossert box, the cable entering the box through a fiber bushing. The drop to the lamp is of same material as the rest of the circuit, namely, twin-conductor lead-covered cable. Each outlet has a vapor-proof receptacle and globe for a 16-candlepower carbon lamp. The receptacles were ordered with the leading-in wires, consisting of lead-covered cable, of such length as to reach to the outlet box without splicing.

Fig. 39.—Boiler Room.

After all wiring had been installed, every junction box and outlet box was filled with a first-class insulating compound. All cabinets were made moistureproof.

In the first story, chiefly on account of the concrete ceiling, but also to afford better mechanical protection for the wires, it was decided to run all wires in conduit. On account of the great number of branch circuits and the long runs, submains were run from the cabinets to certain sections and the tap circuits branched off from these mains through fuse boxes. All wire was of the same kind as used in the basement.

As it was necessary, in order to obtain sufficient intensity of illumination in this space, to use large size tungsten lamps, no such receptacles and globes as used in the basement could be obtained, as they are not made for larger lamps than the ordinary 32-candlepower carbon units. In place of these receptacles, weatherproof sockets were used. The sockets are made of molded mica with groove for reflector, and leading-in wires molded into the socket as described for the basement. All reflectors used in this space were made of steel with porcelain enamel on both sides. Boxes ware filled with compound, as in the basement.

Pilot-Light System. Throughout all the buildings a so-called pilot-light system has been installed, which is a system of lamps so connected that they are independent of the ordinary lighting system and can be controlled from several different points. These lamps are fed from the ordinary distributing cabinets, but are not connected to the busses as are the rest of the lights; they are connected to the riser on the live side of the main switch, thus being made entirely independent of the rest of the system. These lights are controlled by three-way and four-way switches installed at points where watchmen must enter or leave the room. All stair lights are connected to this system; also all lights in bridges and tunnels.

In no case are separate outlets installed for this system, as the pilot lights under ordinary conditions form a part of the general lighting system. For this reason the candlepower of these lamps vary, depending upon their location and the general arrangement of the lighting in each particular section. Therefore we may find some pilot lights with ordinary 50-watt carbon lamps and others having tungsten lamps of the 250-watt size, all the intermediate sizes being, represented

[1] Fourth Installment.

[2] Electrical Engineer with Lockwood, Greene & Company.

also, of course. Under ordinary working conditions there is, therefore, with this arrangement, no set of lamps idle. At closing time the main switches in the cabinet may be opened, which extinguishes all the lights except the pilot lights. The light furnished by these lamps is sufficient to enable the employees to leave the building. Later on, these pilot lights can be extinguished by the watchman. The same operation reversed can be employed in the mornings when the help is coming in.

This is only one way of operating the system. It is evident, however, that its flexibility would permit a great many different combinations to be worked out.

Ordinarily, when wiring for lights which are to be controlled from more than one point, it is found necessary to run as many as four wires between these points. In a plant of such magnitude as the one in question, with buildings of such dimensions, it is at once apparent that such a wiring system would be very expensive. In order to eliminate this expensive method with duplicate sets of wires for each run, a system of connections was worked out which considerably simplified and cheapened the installation of this system. A typical diagram of connections for this system is shown in Fig. 40.

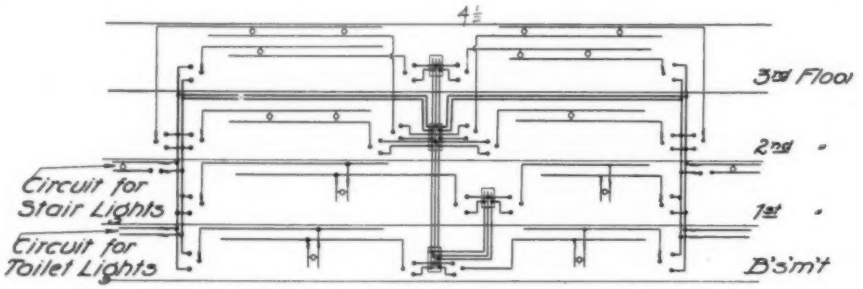


Fig. 40.—Diagram of Connections for Pilot Lamps.

As will be seen from this diagram, the scheme consists of installing two-wire risers at points where the control switches are to be located—for instance, on the walls near the stair towers; two points of a switch are connected to a riser and the third point connected to the circuit wire. In this way the wiring is made as simple as ordinary circuit wiring.

Methods of Illumination.

In a plant of the kind under consideration, with such a number of different departments and such a variety of work, ranging all the way from unloading and storing cotton goods to the printing of cloth, or from the hammering out of a piece of steel in the blacksmith shop to the exceedingly delicate process of engraving or die making, it is to be expected that many different systems of illumination will be found. A brief description of some of the more characteristic features of these different systems is given in the following.

Incandescent lamps are used exclusively throughout the plant; even for lighting the yard this kind of illuminant was adopted. Generally the tungsten lamp is used, but in cases where severe vibration was anticipated or where the ceiling is so low that the lamps are liable to be tampered with, and for all portable lamps, ordinary carbon lamps are used. All carbon lamps are of the 50-watt size; the tungsten lamps range from 25 watts up to 250 watts in size.

In sections where work of a more general nature is carried on—for instance, in all storage spaces, including most of the basements, packing and shipping departments, etc.—general illumination has been provided. The intensity of illumination varies greatly with the nature of the work in the different sections. In some storage spaces for example, an illumination of less than 0.25 foot-candles has been provided, while for the folding and packing departments it amounts to approximately three foot-candles. Usually the lamps for this kind of illumination are installed in the center of each bay, each being equipped with a high-efficiency reflector and hung so as to give even illumination on the working plane. The reflectors used are made of steel with enameled exteriors, (except in first story of central building the equipment of which has already been described) the inside having a mat aluminum finish.

The average watts per square foot of floor space for the different buildings is given in the following table.

TABLE II.

Office building	0.50
Singe building	0.28
Finishing building (approximate)	0.25
Dye house and bleachery	0.19
Printing building	0.185
Power house	0.18
Total average for the plant	0.22

The turbine room and the central portion of the boiler room are lighted with 250-watt tungsten lamps, hung 25 feet from the floor and having intensive reflectors. Fig. 2 (See first article of this series) shows a few of these units for the turbine room. On the columns directly in front of the switchboard will be seen angle reflectors which are used for illuminating the board. Fig. 39 is an interior view of one end of the boiler room. The necessary illumination for this space is furnished by the large tungsten units seen in the figure. In addition to these there is installed for each water gauge a small lamp with a conical reflector. In the boiler room as well as in the turbine room there is provision for local or emergency lighting, through numerous receptacles along the walls, from which portable lamps may be fed.

A department which requires particularly good lighting, not only as to intensity of illumination but also as to the inherent characteristics of the light itself, is the printing department, and especially that section of this department where the printing processes take place. In this section such work as color matching and close inspection of the cloth must at all times be possible, and it is therefore but natural that the question of light becomes one of prime importance.

In most print works today the illuminant used is the arc lamp, as it was found that for color matching this illuminant was much to be preferred to

□ = Distributing Cabinet
o • Light Outlet
m • Fuse
:•• 3-way Switch
••• S.P. "

Wiring Symbols.

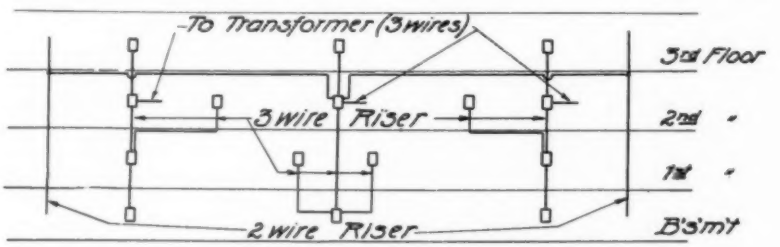


Fig. 41.—Diagram of Risers.

the ordinary carbon-filament incandescent lamp. But since the metal-filament lamps, and particularly the tungsten lamp, came on the market it has been found that they possess characteristics which enable them to compete very favorably with the arc lamp for use in places where such work as color matching is being done. As a result of considerable experimental work it was decided to adopt the tungsten lamp, for this installation.

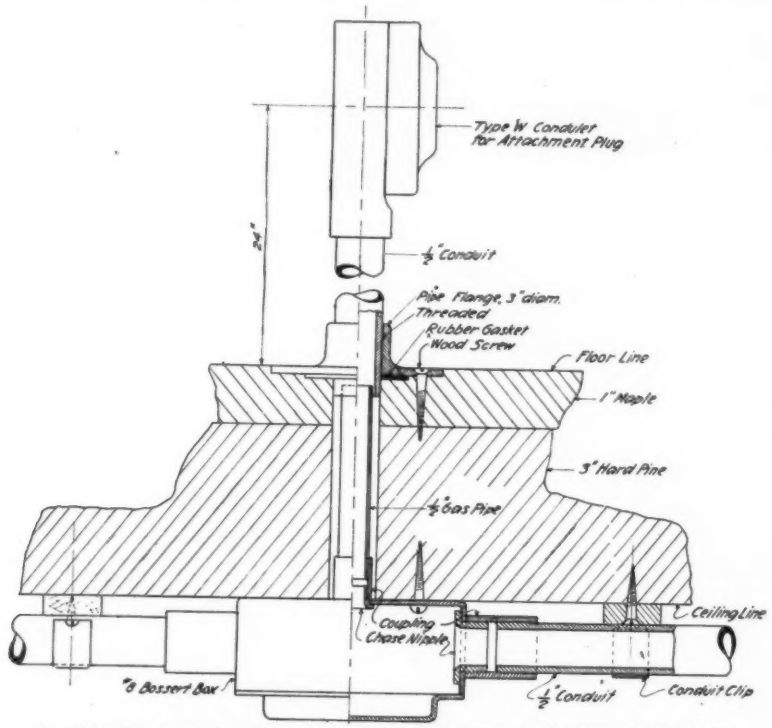


Fig. 42.—Details of Construction for Extension Lamps to Pantagraph Machines.

The printing machines occupy the entire second floor of the printing building. The open space in front of these machines has a width of about 25 feet, while the length is the entire length of the building—700 feet. This entire space requires good general illumination, while the maximum light is desired to one side of this space, the side where the printing machines are located. The cloth leaves the machines, passing over a roll located about five feet above the floor, and from this roll it runs almost vertically to another roll located on the gallery above. It is at this point, between the first and the second rolls, that the cloth is closely watched by the operator. For this reason the maximum illumination is wanted on the cloth from where it leaves the first roll to several feet above this point. Enough light must of course be provided to enable the operator to follow the cloth with his eyes all the way up to the second roll.

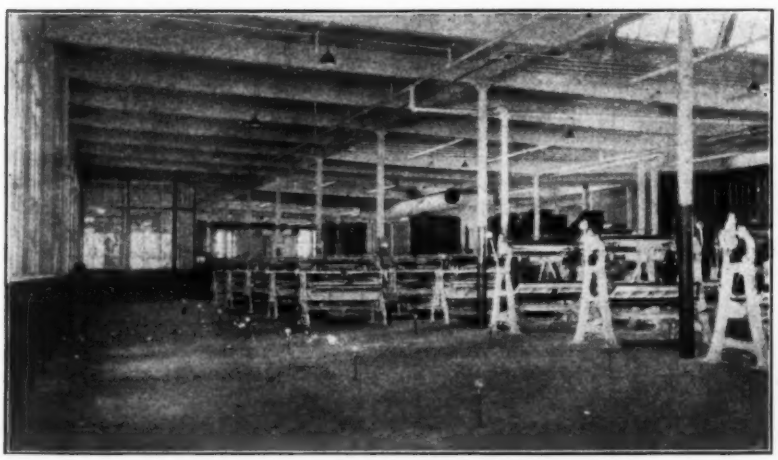


Fig. 43.—Pantagraph Department.

The manner of lighting this space so that all these conditions were realized was shown in Figs. 22 and 23. There is a row of tungsten lamps, of the 250-watt size, installed on the center line of the open space between the front of the machines and the wall. There are 48 of these lamps, one for each machine. They are hung approximately 21 feet above the floor and supported rigidly with half-inch iron conduit. Each lamp is equipped with a special intensifying angle reflector, the candlepower distribution of which is such as to throw the light so that the foregoing requirements are met. In addition to this, each machine is provided with a receptacle for a portable hand lamp. The dry cans in back of the printing machines are similarly equipped. The average watts per square foot for the space in front of the printing machines is 0.8, and the maximum illumination on the cloth in front of the operator is 6 foot-candles.

For such departments as calendering, drying, aging, repair shops, etc., local lighting for the machines in the form of large-size tungsten units was provided. Such lamps were hung high and equipped with extensive reflectors, so that a good general illumination of the entire space was obtained.

On some floors in the finishing building, where the finished goods are stored on racks located along the two long sides of the building, leaving a trucking alley in between, the scheme of lighting was worked out as follows.

The racks are located 10 feet apart, on centers. Those on one side are 34 feet long, those on the other side 44 feet, which leaves an alley between them about 8 feet wide. Close to the ceiling, on the center line of each rack and in the middle of the alley are installed outlets for 25-watt tungsten lamps; also, directly over the center of each rack. Every fourth outlet over the trucking space is on a separate circuit and is connected to the pilot system. These lamps are intended to burn nearly all the time when work is going on in this department, and will give enough light to enable a man to easily find his way to any desired section. The rest of the outlets are on the regular lighting system and are wired in groups taking in sections of from six to eight racks. Each such group is controlled by a separate switch installed in the ceiling close to the nearest pilot light, which is about the center of the group. The switches are of the pull type, with cord extending to within 7 feet of the floor.

This arrangement of switching is a very efficient one, as it allows for local control and thus makes it possible to burn only those groups of lamps in which section work is being done.

The basement of the office building is

used as a store-room for printing rolls. These rolls are stored in racks arranged as described above for the finishing building. The lighting of these racks had to be so arranged that it would enable a man to read a tag attached to the rolls at any point on the rack. This requirement was fulfilled by using portable handlamps, one for each space between two racks. The lamps are fed from outlets in center of each space and are attached to a cord of such length that the lamp may be carried to any point on the racks. The lamps consist of a substantial wooden handle with key socket and wire guard. When not in use, they are hung on hooks installed at the end of the racks next to the alley.

The entire first floor of the office building is occupied by general and private offices. There all wiring is of the concealed type. Chain pendent fixtures are used for general lighting throughout. In addition, a liberal amount of wall and floor receptacles has been provided to allow for desk lights, fans, etc.

The second and third floors of the office building are occupied by the departments for the turning out of printing rolls, such as engraving, etching, plate cutting, sketch making, pantographing, etc. These floors are provided with general illumination and also individual illumination for each machine bench or work space. The fixtures for individual illumination are greatly different for the different departments, as the requirements vary much. For ordinary lathes and grindstones adjustable ceiling fixtures are used. For engraving and clamping machines a floor outlet has been provided, from which outlet a cord is carried to a special fixture attached to the head of the machine. These fixtures have flexible arms and can be adjusted in any desired position relative to the cutting tool. They travel with the tool and therefore, when once set, no further adjustment is required.

The hand engravers and etchers are working at benches located along the walls. Each man is provided with a receptacle for a portable desk lamp.

The pantograph machines on the third floor are each provided with a floor outlet. The wiring for these outlets is run on the ceiling of the story below, where all the outlet boxes are installed, the wires being brought up through the floor in conduit, which conduit extends about two feet above the floor and comes inside of the frame of the machine. The end of the conduit is provided with a fitting or an attachment plug. A detail of this construction is shown in Fig. 42.

Each pantograph machine is supplied with two lighting fixtures, one at each end of the machine, in order to eliminate shadows. Machines with flat tables have ordinary portable desk fixtures with flexible arms; those of the cradle type have similar fixtures, but they are furnished with a clamping device instead of a foot and are clamped to the frame of the machines. The wires are run under the tables and attach to the fitting mentioned above.

The wiring for the plate cutters' and sketch makers' benches is similar to that for the pantograph machines, but different fixtures are used. Instead of receptacles and portable desk fixtures, each bench has an adjustable floor fixture installed back of the bench and near the left-hand end of it.

Fig. 43 is a general view of the departments for pantographing, plate cutting and sketch making and shows the different systems of lighting used for this kind of work.

Yard Lighting System.

The layout of this system was shown in Fig. 2. (See first article.)

Most of the lamps are supported from the buildings. Each consists of a 100-watt multiple tungsten lamp installed in a substantial fixture of the street type. The fixtures bring the lamps out four feet from the wall and are hung about 20 feet above the ground. (See Fig. 29.)

The lamps are divided on two separate circuits, No. 1 and No. 2. Circuit No. 1 is intended to be in use all night and to furnish enough light in the yard for any ordinary purpose. Circuit No. 2 is intended to be in use only at intervals, such as when the help is entering or leaving the plant, or in case of emergency of some kind. Both circuits are controlled from the turbine room. All wiring is run inside of buildings and is mostly in conduit. Wires to fixtures on poles back of the store house are run underground in conduit from the basement of this building. Each such lamp is protected by separate cutout.

Signal, Clock, Time Recording Systems, etc.

Signal System. A complete system for automatic signalling has been installed in this plant. It is in the form of bells and gongs located on each floor of the different buildings, and also at certain points in the yard. These bells are controlled from a central station, installed at the principal office of the company, which is located a little over a mile from the Print Works Department. All signals are sent from this point through an ordinary telephone cable to a relay board at the plant; the relays, in turn, connect the bells to a 220-volt direct-current circuit on which they are designed to operate. This system is used for calling officials to the telephone, and for sending out commencing and dismissal signals for the employees.

Time Clocks, Time Recorders and Watchmen's Clock System. Throughout the plant complete systems of time clocks, time recordsrs for the employees. and watchmen's stations have been installed. These systems are all governed by a master clock, located in the general offices of the office building. They are run by a storage battery installed in the southwest tower of the central building.

All wiring for these systems is run in conduits, similar to that of lighting system. Watchmen's stations are mounted on a special cast-iron box in which the conduit terminates, thus making all connections concealed.

Secondary clocks all have copper cases. They may be single or double faced, according to their location; the dials vary in size from 12 to 24 inches. In places where excessive moisture or dust is expected to be encountered, the clocks are furnished with moisture proof or dustproof cases.

The Pacific Mills New Print Works Department, the electrical equipment of which has been briefly outlined in these articles, was designed by Lockwood, Greene & Company; the buildings were erected and all equipment installed under their supervision. All direct-current machinery, with accessories was furnished by the Crocker-Wheeler Company, with controllers of the Cutler-Hammer Company's make. All alternating-current motors and the new turbo-alternator were furnished by the General Electric Company. The DeLaval Steam Turbine Company furnished the direct current torbogenerators, also the double generator turbo unit and the turbo-exciter. The Westinghouse Electric & Manufacturing Company furnished and installed the switchboards. The Holophane Works of the General Electric Company furnished all reflectors for the lighting system. All electric wiring was installed by the Lawrence Electrical Supply and Construction Company.

Wiring Contracts Open.

Several new contracts for wiring are ready to be let at Story City, Iowa. One of these is for the Old Peoples' Home and Sanitarium, a building with two wings, 40 by 100 feet, consisting of two stories and basement. The wiring in this building will be in conduit throughout. It will have some special features, as the room of each patient will be so wired that a signal lamp may be lighted by the patient. This building is being constructed by Cole Brothers, of Ames.

The Story City National Bank is about to construct a two-story building, which in addition to the bank will contain a general store, a barber shop and offices. This is a case of knob-and-tube work and is under the direction of John Donhowe.

Ground is also being broken for a new hotel and auditorium, which will contain also stores and offices. This building will be 175 by 90 feet and the wiring will be knob-and-tube work. T. T. Henderson is in charge of this.

AN ACCOUNTING SYSTEM FOR ELECTRICAL CONTRACTORS.

By W. J. Ball.[1]

The writer has been in business as manager and secretary of an electrical contracting firm for the past fifteen years, and up to two years ago he was doing business, as far as bookkeeping, costs, etc., were concerned, in just the same manner as he was when he started. About two years ago we began to realize that our business was outgrowing our bookkeeping methods, and that in order to keep up with our growth, we would have to adopt a different system than the one we were using.

To begin with, we worked out a method for handling the material and labor used on the different jobs. It had always taken a great deal of time to get the amounts of like material lumped together after the completion of a job in order to do the pricing. We, therefore, adopted the sheet which is shown in Fig. 1, and each kind of material is now kept by itself on this sheet. We can tell at a glance just how much of any material we have on any job at any time.

Each job is numbered and the work slip (Fig. 2) given to the wireman bears the same number. He is given a work slip every day for the job until it is completed. These work slips are with the date and amount sent out each day, the names of the materials being entered in the oblique columns and the quantities in the corresponding vertical columns, as shown. The amounts sent out are totaled up and the amount returned subtracted, and thus the amount used is shown at the bottom of the sheet.

TRI-CITY ELECTRIC CO.
MOLINE, ILLINOIS

Permit No. _____ Work Order No. _____

Customer _____ Address _____ Customer's Order No. _____

Description of Work

Workmen

RECORD OF MATERIAL DELIVERED AND RETURNED

DATE	½" Conduit	#14 Duplex	4" Boxes	etc.
5/1	500	500	20	
5	200			
6			10	
Total Del'd				
Mdse. Ret'd				
Mdse. Used				

Fig. 1.—Sheet on Which Record of All Material Sent out and That Returned is Entered.

TRI-CITY ELECTRIC CO.
MOLINE, ILL.

Work Order No. _____
Contract No. _____

WORK ORDER

Date _____ 19___

Name of Workman _____

Customer _____

DESCRIPTION OF WORK	Hrs.	Min.	Car Fare	REMARKS

Fig. 2.—Form of Work Order Sheet.

STATEMENT

Moline, Illinois, _____ 191___

Mr. _____

IN ACCOUNT WITH

Tri-City Electric Company

1529-1531 THIRD AVENUE

TELEPHONE E-247

Fig. 3.—Statement Blank.

[1] President of the Electrical Contractors' Association of the State of Illinois.

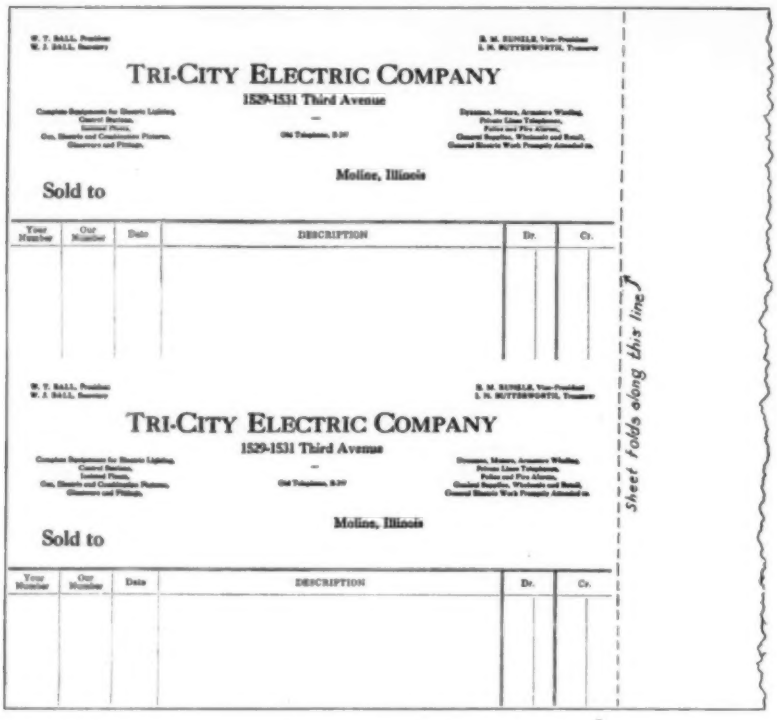


Fig. 4.—Invoice Sheet.

entered up each day by the time-keeper, the number, dates and hours being shown on the Time Record sheet (Fig. 6), one for each man each week. We pay off from these time record sheets each week.

We use voucher checks in paying the men, and for paying all invoices, one half of the check being torn off for the bookkeeper, the duplicate being the back of the check, which shows just what invoices are paid. The check is a receipt when returned, and is clipped to the invoices and filed. Each check is numbered and all are entered in consecutive order in our general journal. This book shows a complete distribution of accounts and only the monthly footings are posted.

Our charges are made from the material sheet and Time Record sheets on a typewriter.

We use a folded invoice sheet (Fig. 4), there being one, two, or three invoices to the sheet. These are torn oft and mailed as soon as made out, and the duplicate makes a page in our customers' journal, from which post-

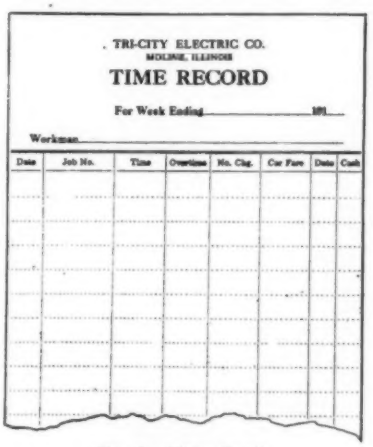


Fig. 6.—Time Card.

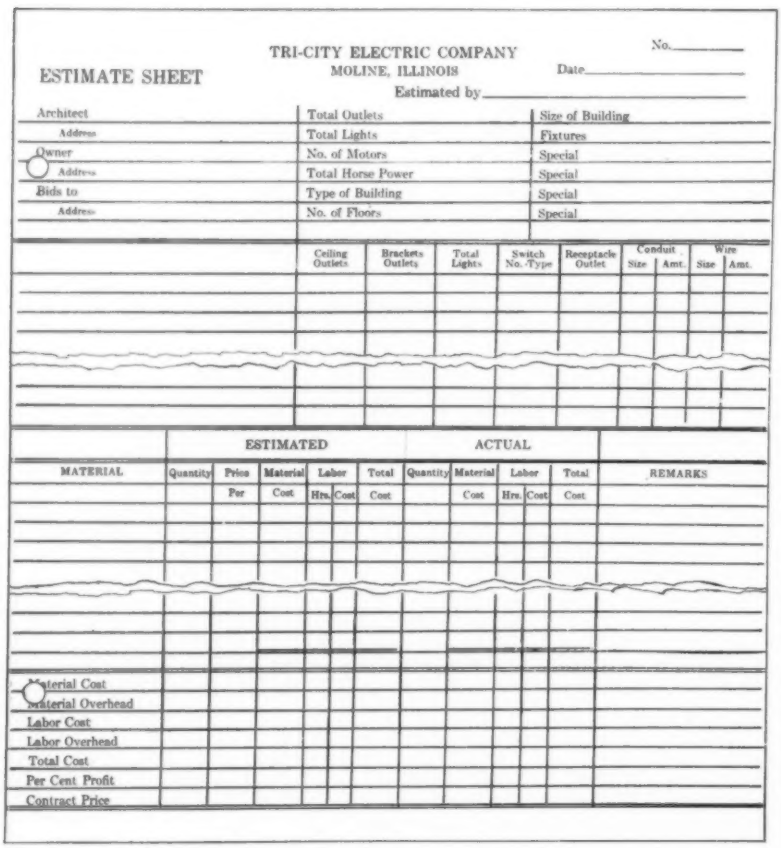


Fig. 5.—Form Used in Preparing Estimate.

ing is done to the ledger. It should be explained that the invoice sheet is arranged so that it will fold along the center line extending from the top to the bottom of the sheet, lengthwise. On the left-hand page the headings of the invoices we send out are printed. When we go to make out an invoice, we fold the right-hand half of the sheet back under the left half and put a piece of carbon paper between the two sheets. Thus we get the duplicate of the invoice as it is made on the typewriter. The duplicate is of the right length, and is properly punched, for binding in the customers' journal. Only a small part of the sheet on which the duplicate is made is shown in Fig. 4.

Although Fig. 4 does not show this, when more than one invoice is printed on a sheet the sheet is punched along the horizontal line separating the invoice forms, so that a form can be readily torn off when it has been filled out.

Our ledger is a loose-leaf one, and is so indexed that not over two turns are

required to find any name in the book. Our books cannot get out of balance.

We bill promptly, and this means that we expect to be paid promptly. We use a Burroughs adding machine on all estimates, on our books, and whereever else necessary. This machine is also used in getting out our statements; it puts in the dates, debits, credits and balances due, and does work in about three hours, and proves it, which it previously took about two days to do with no proof of its being correct.

The writer wishes to call attention to his company's Estimate Sheet (Fig. 5). Although we have some alterations in it under consideration, we think the sheet of interest to electrical contractors.

The most important item on this sheet is "Overhead Expense." This is an item which has not troubled the average electrical contractor until lately, because he did not know he had any, or if he did know he had it he did not know how to find out how much it was and how to make his work pay it. We base our overhead on the "man-hour labor;" we determine this each month on the expense and number of hours worked, and average it with all previous months. The overhead is based on the "man-hour labor" rather than on the amount of business done for this reason: the job that takes 100 hours labor and $10 worth of material costs ten times, as much as far as overhead is concerned, as the job that takes 10 hours labor and $100 worth of material. Rent, salaries, light, heat, hauling, etc., cover a period ten times as long in the first instance as in the second one. We have used this system for over a year and have the figures to prove that we are right and with a certain percentage of increase in gross business can show an increased percentage in net profits that we never had before.

We believe, in conclusion, that anything that helps us is worth telling our competitors, for only by co-operation of this kind can the electrical contractor ever hope to be successful. If his ambition is only to make day wages, he has no business in the contracting game and will never amount to anything there; he is a detriment to the business. Let him go to work for some one who does know how to run a business—who knows what a job is worth and who will make the price and stand by it, win or lose.

If the electrical contractors in general would pay more attention to their own business, and put in the same efforts to make a success that they do to find out what their competitor is doing, what his bid was on some job or another, so that they can cut his price and take it away from him regardless of the profits, then the business would take a jump forward that would be surprising, and there would not be so much need for electrical development and co-operative organizations as there is now.

Our motto is: Forever boost the game, blow your own horn, and attend to your own business first, last and all the time.

W. J. Collins.

There is probably no man of his age in Illinois who is better known to the electrical contractors of the state than W. J. Collins. Mr. Collins is not a contractor; but he is engaged in the contracting business and devotes all his time to it. He is the secretary of the Faraday Electrical Association of Chicago and business manager of the Chicago Association of Electrical Contractors. The first position he has held since soon after the formation of the

W. J. Collins.

Association; to the second he was appointed after he had demonstrated his fitness for it by the way in which he discharged the duties of the first.

The sort of work that Mr. Collins is doing requires ability of no mean order; it is a job, one would think, that requires tact and energy and resourcefulness in an unusual degree. Co-operation is an easy theme for convention orations. But when it comes to working out and applying, and keeping applied, effective schemes for insuring unified effort for the common good among electrical contractors of a large city some very practical difficulties are liable to be encountered. These difficulties have been handled wonderfully well in Chicago, and, while he has been in close touch all the time with some of the best of the leaders in the contracting field, Mr. Collins has personally had a great deal to do with removing such obstacles in the way of co-operation as have arisen.

Mr. Collins's progress in life has been largely due to his own individual efforts, for he was a fellow whom fortune was kind enough to throw early upon his own resources. It was soon evident that he needed neither governess nor guardian. Personally he is a young man who thinks well of himself but whose right to do so nobody who knows him seems inclined to dispute. He is a good fellow and a good man for the job he has.

Among the Contractors.

The Eastern Electric Company is a newly formed company doing a general electrical contracting, supply and fixture business at 129 West Main street, Battle Creek, Mich.

The Central Electric Company, of Battle Creek, Mich., is doing all electrical work on the new addition to the Post Tavern and the addition to the "Post" office building in that city.

Greenlee & Wilson, of Belvidere, Ill., have been awarded the contract for the electric wiring and fixtures for the new Boone County almshouse.

The United Electric Construction Company, Philadelphia, Pa., has obtained contracts for the equipment for the Villa Maria Academy, at Frazer, Pa., and for the new dispensary building of the American Vicose Company, at Marcus Hook.

Koellen & Endress, of Madison, Wis., have secured the contract for wiring the Gremm book-bindery building and furnishing the fixtures; also for wiring and furnishing fixtures for the new store building of Charles J. Speth.

The Farnsworth Electrical Company, a leading contracting firm, of Bowling Green, Ky., has taken larger quarters, having leased space in the Yarbrough Building. Increased business is given by the concern as the reason for the expansion.

A contract recently awarded the Emmons Electric Company, of Chicago, calls for the installation of the circuit for about 900 lamps in a new building in this city.

The new Burnside School building, in Chicago, will be wired by L. H. Lamont & Company, of this city.

The Smith Electric Company, of Indianapolis, Ind., has just been awarded an important contract to install the electric work in some new property owned by Dr. W. R. Mays, in that city.

Dollar Wiring Kinks.

Every reader is invited to contribute to this column. It does not matter how few words are used to explain a "Dollar Wiring Kink," provided the idea is made clear; and if a diagram is necessary, a rough pencil drawing will serve. The idea itself must, of course, be new and bright. A dollar will be sent to the contributor upon publication.

Installing Service Pipes.

In the installation of wiring in neighborhoods where overhead distribution is employed, it is generally best to locate the service switch and fuses in a cabinet in the basement and to carry the service wires into this cabinet in a line of conduit extending from the cabinet through the wall to the outside, and thence up the wall to the point, where the wires reach the building.

The quickest way to install one of these pipes is to make the hole where the circuit is to enter the house and round off the upper edges of this at the outer end, and then make all necessary bends in the conduit by thrusting it into this hole and applying the force needed. The bend where the wires are to enter the tube should be made first, and this piece of pipe laid to one side. Then the end which is to enter the cabinet should be thrust through the wall, the service box fastened on with a locknut and bushing (the hole for the pipe having been made in the back of the cabinet), the box pulled up against the wall and fastened there, and the pipe bent upwards on the outside. Any necessary offsets can be made in the pipe by applying force with the hands after it has been fastened in the service cabinet as explained.

The method will result in a saving of two-thirds the time required where the wireman hunts around for some place to bend the pipe.

J. B. Wathier.

A Practical Wire Rack.

A good wire rack may be made by taking a piece of 2 by 4-inch timber, about 8 feet long, and screwing six floor flanges on the face of it, spacing these so that they will be some 14 inches apart. Half these flanges should be selected to accommodate pieces of half-inch conduit, and the other three chosen for three-quarter-inch pipe. These pieces of pipe should be cut a convenient length, and one end of each piece threaded for insertion in the floor flange and the other to receive a cap. The rack can be fastened on the wall with lag screws. The half-inch conduits make very convenient supports for coils of No. 12, No. 14 or No. 16 wire, while larger wires can be hung on the larger pipes.

James McCartin.

Wiring to Crane Motor.

Fig. 1 illustrates a simple method of feeding current to a motor-driven crane, which has proved very practical in a lumber yard where steady crane service is required.

The control mechanism of the motor is contained in a motor house built around

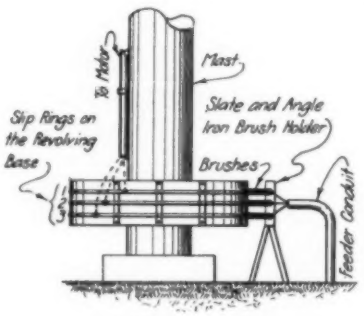


Fig. 1.—Connections at Base of Mast.

the vertical mast. The support for the slip rings is shown developed, for the sake of simplicity; but it should be understood that this support is attached to the base of the mast so as to make substantial workman-like construction.

Morris Moriarity.

When the Switchbox is Not Flush.

I have read the several articles on methods of setting push-button switches when the switchbox is not flush with the

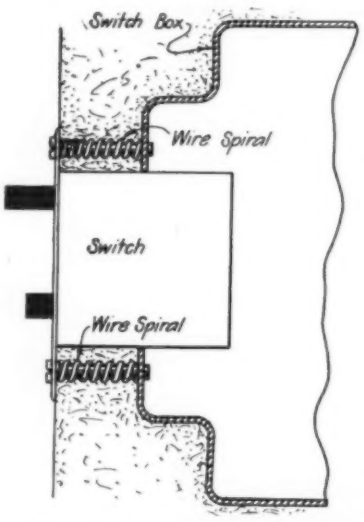


Fig. 2.—Method of Setting Switch.

finished wall, and all of them seemed to contain ideas that were good. My way of overcoming the difficulty, though, is illustrated in Fig. 2. The figure hardly needs any explanation. It will be noted that a long screw and a spiral made of wire are used. The spiral may be formed of No. 14 copper wire or of wire solder, but I consider the latter the better material to use.

Jack Robinson.

Threading Pipes on Ceilings.

When gas pipes in combination outlet boxes are too long, I cut them off within one inch of the ceiling, and then to thread them I reverse the dies in the stock and hold the stock in the reverse manner. I find that, by applying soft white lead to the pipe, it is a simple matter to cut the threads.

The above procedure avoids the necessity of putting additional brass collars on fixtures.

Joseph B. Josephson.

Efficient Test Lamps.

The following is what I have found to be a most convenient way of making up lamps to be used in such testing as the practical electrician is most frequently called upon to do. I have used test lamps arranged in this way for several years in making tests on 110-220-volt circuits.

Two T. H. adapters are used, and a screw is soldered in the contact holes in the top of each one of these, while to each screw one of the conductors of a two-conductor lamp cord is attached. The shells (and rings) of the two adapters are then connected together by means of a short piece of wire, which is thoroughly soldered in place at each end. Finally, the entire device is covered with a number of layers of tape, so as to leave only the receptacles where the lamps are to be inserted open. This holds the adapters apart, and makes it easier to handle them.

I generally use two 110-volt lamps, one in each adapter, the arrangement being such, of course, that the lamps are in series. Whenever it is desired to have the lamp burn at full brilliancy on a 110-volt circuit, a plug fuse is substituted for one of the lamps.

F. H. Pavey.

Changing Old Fixtures.

In changing old gas fixtures to electric, instead of soldering the key in the gas cock to prevent its being turned, it is a good plan, I find, to make a notch in that part of the valve that prevents the key from turning all the way around large enough for the pin on the key to fit in. Then when the pin is placed in this notch and the valve screw tightened, the valve stem cannot possibly be turned.

This method prevents the finish being spoiled and permits the valve to be taken apart in case this should ever be necessary.

W. Reilly.

Public Service Commissions

CALIFORNIA.

The Home Telephone & Telegraph Company was granted a certificate of public convenience and necessity to exercise franchise rights in the city of South Pasadena.

A decision was rendered by the Railroad Commission granting authority to the Southern California Edison Company to pledge as collateral security for loans, a portion of the $2,500,000 of bonds previously authorized.

A decision was rendered granting authority to the Pacific Gas & Electric Company to issue $5,000,000 of bonds, for the purpose of carrying on its development work at Bear River. Authority was also granted the Pacific Gas & Electric Company to renew six notes in the total sum of $150,000.

A decision was rendered denying the petition of the Sierra & San Francisco Power Company for authority to intervene and to present evidence in connection with the application of the Oro Electric Corporation to enter a portion of San Joaquin County. The Commission found that the complainant did not operate in the section affected, and had no representative at the hearing.

OKLAHOMA.

The power of the Oklahoma Corporation Commission to penalize the Pioneer Telephone Company one-third of its customary rates in Muskogee, Okla., during the month of October, 1910, has been denied by the Oklahoma Supreme Court The Commission had made an order giving the company until November 1 of that year to put its exchange in perfect condition and ordered that the rates be reduced while the changes were being made effective. The reduction meant a loss to the company of $4,233.72. The Court reversed the Commission's order and held that the order to improve service was the only one which could properly have been made by it.

WISCONSIN.

The petition of the New Lisbon Mutual Telephone Company for a physical connection with the Mauston Electric Service Company has been denied by the Wisconsin Railroad Commission. An investigation of the existing conditions convinced the Commission that a physical connection of the two systems would result in considerable benefit to the petitioner but would be decidedly disadvantageous to the Mauston Company.

The question of the reasonableness of the clause in the Wisconsin Telephone Company's contract which provides for the use of silent numbers, has been carried to the Commission on complaint of certain subscribers in the city of Milwaukee. The complaint alleges that the practice is discriminatory and that it works a hardship on many patrons of the company. The Commission has issued notice that a hearing will be held on the matter but as yet no date has been set.

To enable the Chippewa Valley Railway, Light and Power Company to extend its system by taking over the property and franchise of the Spring Valley Light and Power Company, the Commission has authorized the issue of $15,000 in stock, the stock to be exchanged for the property acquired.

The application of the Kaukana Electric Light and Power Company for a rehearing on the matter of the compensation to be paid for the property by the city of Kaukana has been denied by the Commission. The rehearing was requested on the grounds that the going value allowed by the Commission was insufficient and that the value of certain contracts held by the company had been underestimated. The Commission, after careful review of the testimony and facts in the case, could find no reason for altering the decision previously rendered.

Among the Supply Men

The Illinois Electric Company, Chicago, Ill., has opened up a new territory and has reorganized its present selling organization. Five men have been added to the sales force since the middle of February. N. G. Harvey, the genial general manager, is on a two weeks' trip.

The Independent Electrical Supply Company, 59 Warren Street, New York, announces that W. A. Thompson, for seven years connected with C. S. Knowles, of Boston, Mass., will take on the sales end of the company for the Far West, with headquarters at Denver. The company is featuring the "Indesco" sparker and auto dry cell, "Indesco" showers and the "Indesco" alternating-current bell ringer. Representatives and headquarters have been established as follows: G. W. Russell, Detroit; C. G. Morgenthan, Washington, D. C., and Mr. Thompson as above.

The W. F. Irish Electric Company, 35 and 37 East Tenth Street, New York, is carrying on a sales campaign on electric fans with very good results. The company recently put in a large distributing main switchboard at its big store, and now has one call "Stuyvesant 2226." This takes care of the Tenth Street store and the branches at 60 Cortlandt Street, 161 West Thirty-fourth Street and 24 East One Hundred Twenty-fifth Street. This is found to be a great time-saver for the company and a convenience for the customers. The company has had a big sale on Gyro ceiling and column fans, which are particularly adapted for restaurants, hotels and large office buildings where forced ventilation is necessary. Theodore Trenelberg, factory foreman for the company, will spend the summer months in Germany on a business and pleasure trip.

The Spindler-Richards Electric Appliance Company has been established at Tacoma, Wash., to handle all classes of electrical appliances and especially those used for heating and cooking purposes. William H. Spindler, formerly manager of the electrical department of Rhodes Brothers, a department store handling electrical supplies, and C. A. Richards, formerly of the Kendrick Electric Company, compose the firm. Both have had a wide experience and been very successful in their work.

Woodward, Wight & Company, Limited, New Orleans, La., has sold to T. S. Reed, of Beaumont, Texas, for installation at De Ridder, La., a modern municipal electric light plant, consisting of a General Electric steam turbine unit and direct-connected engine-type generator. The Woodward-Wight organization is rapidly forging to the front and has pulled down a lot of very interesting orders in the last two or three months. The impending opening of the Panama Canal indicates that the live supply men in New Orleans are in line for big business.

I. E. Greene, sales manager of the H. C. Roberts Electric Supply Company, Syracuse, N. Y., states that the company has added to its force making the territory east of Utica in New York State. The company has also put on two extra men in the shipping department. They will hold a salesmen's convention in the Philadelphia office some time in September, and this meeting is looked forward to as one of the most pleasant and profitable of the year. The company has passed through a four weeks' strike of all the unions in the city, and this showed considerably in its city business. The strike is now over and the business is coming in strongly again—even better than before. The company can see no sign of the looked-for hard times, and the pole-line construction department is not worrying about selling material, but how to get it fast enough to fill orders.

Combination Spanish Lamp Works.

According to an American consul, plans are well advanced for the erection of a large factory at Madrid, Spain, to manufacture incandescent lamps. It is understood that three large manufacturing concerns have united to build it, viz., the Spanish Thomson-Houston Company, the Siemens-Schukertwerke, and the manufacturers of the so-called Osram lamps. It is reported that employment will be given to about 4,000 persons, mostly women.

STANDARD SPECIFICATIONS FOR COPPER WIRE.

Reports at Convention for Testing Materials.

The sixteenth annual meeting of the American Society for Testing Material was held at Atlantic City, N. J., June 24 to 28.

Upon the last day of the convention a report was made by Committee B-I on Standard Specifications for Copper Wire. The Committee recommended a number of changes in the specifications for hard-drawn copper wire, for medium wire and for annealed wire.

The Committee recommended substituting the word "resistivity" for "conductivity" in the specifications and the substitution of figures 8.89 for 8.90 as a standard specific gravity. This is done for the sake of uniformity with the American Institute of Electrical Engineers and the International Electrotechnical Commission, although the Committee believes that the present commercial output of copper for electrical use does not have a value as low as this at 20 degrees. In case the proposed new international standard of conductivity is adopted by the International Electrotechnical Commission, it is proposed to change from the present standard to the value thus adopted.

The following statement expresses the point of view of the Committee upon this matter.

"Electrical conductivity was formerly expressed as a percentage on the basis of a determination, made by Matthiessen about 1865, of the electric resistivity of supposedly pure copper. Since that time the methods of refining copper have advanced, so that it is not uncommon to find copper of over 100-per-cent conductivity on the Matthiessen basis. There has heretofore not been international agreement on the electric resistivity of copper to be considered the standard for the expression of conductivity. While it is to be expected that an international agreement upon a standard for the resistivity of copper equals to 100-per-cent conductivity, will be adopted by the International Electrotechnical Commission in September, 1913, it has been deemed preferable to express the requirements in standard specifications in the terms of quantities directly measurable, rather than by reference to some quantity whose standard value is the subject of agreement only. The use of the arbitrary term "conductivity" has no more warrant that the employment of arbitrary gauge numbers. Therefore, in these specifications the requirements are stated as the maximum rejection limits to the resistivity."

J. A. Capp is chairman of the committee.

A report was presented to the convention by Charles W. Burrows entitled "A Magnetic Criterion of the Mechanical Properties of a One-Per-Cent Carbon Steel." This pointed out the dependence of both mechanical and magnetic properties upon the heat treatment and chemical composition of the steel, and pointed out the possible relationships between the two. Measurements so far have been made upon a one-per-cent carbon steel subject to various heat treatments and the variation of magnetic and mechanical properties has been followed. Curves were presented showing the variation of normal inductance with different heat instruments. In many cases a high residual induction accompanies mechanical softness and high coercive force accompanies mechanical strength. It was found that the magnetic induction with a magnetizing field of 50 gausses constitutes a good criterion of whether a specimen of steel has been properly prepared.

Magnetic qualities are very sensitive to differences in mechanical structure and the mechanical properties can undoubtedly be foretold from a complete knowledge of magnetic data. It is probable that only a limited portion of the magnetic data will be sufficient for this purpose, but the present investigation has not progressed far enough to determine just which data will be sufficient, or what constants will be most suitable. The report is only a preliminary one and the investigation will be carried on further.

New Method of Controlling Motors.

In a new method of controlling electric motors used for operating ordnance, steering gear, swing bridges, etc., a rotatable resistance box is geared to the driven apparatus, so that when the contact arm is moved, and the apparatus is set in motion, the box follows the arm until the latter stands at the off position, when the motor comes to rest.

Experimental Generating Plant in Germany.

To experiment with the generation of electricity by the power produced by the ebb and flow of the tide, a station is being erected between Nordstrand Island and the city of Husum, on the North Sea, in the Province of Schlewig-Holstein, Germany. It is hoped with a fall of 0.8 meter (2.6 feet) to produce 5,000 horsepower.

Electric Power Used in Norway.

The total electrical power used in Norway in 1912 amounted to 370,000 kilowatts, mostly for electrochemnical purposes. For the fixation of atmospheric nitrates alone 107,000 kilowatts were used.

Questions and Answers.

All readers of the Electrical Review and Western Electrician are invited to submit questions and answers to this department. Full names will not be printed except where the writer indicates his willingness therefor. Anonymous communications will not be considered. Questions relating to electrical matters of any kind will be inserted. Answers from our readers should be received in this office preferably within ten days of the date of publication of the question, and will be published in a subsequent issue. Payment will be made for all answers published.

Questions.

No. 142.—Allowance for Reduced Maximum Demand in Summer.—Recently I read an article explaining a rate system used by a British central station in which the number of hours charged for at the primary rate was less in summer than in winter, so as to compensate for the reduced maximum demand and decreased lighting load in summer and to encourage the use of electricity for cooking. Is this system in use anywhere in this country?—F. D., Racine, Wis.

No. 150.—Meters Outside the Building.—Is the installing of meters on the outside of buildings under verandas considered good practice? Would frost have a bad effect on the mechanism of the meter?—R. M., St. Catharines, Ont.

No. 151.—Copper Wire Base.—Will some one kindly explain how the base on copper wire is calculated from standard spot or electrolytic copper quotations? If the wire base is not calculated from the quotations, kindly explain how it is calculated.—R. L. L., Minneapolis, Minn.

No. 152.—Motor Trouble.—I am having trouble with a double-commutator Commercial motor and controller. Both were taken down for repair and it is possible that tags marking the terminal wires were not put on properly. At any rate, I have failed to get the machine properly connected again. The manufacturers of this motor are out of business and I am unable to get a connection diagram from them. Can any reader furnish such a diagram?—T. N. P., Connersville, Ind.

No. 153.—Thermoelectric Couple Actuated by Sun's Rays.—Has any successful attempt ever been made to generate electricity direct from the sun's rays by focusing them upon a compound thermoelectric couple? What voltage can be generated in this manner?—J. T., Jacksonville, Fla.

No. 154.—Lightning Rods.—Has copper any advantages over iron wire for lightning rods?—W. S. C., St. Joseph, Mo.

No. 155.—Prevention of Corona Loss.—In steadily increasing the voltage of long-distance transmission lines, what precautions are taken to prevent or minimize the loss from corona?—E. T. H., Phenix, Ariz.

Answers.

No. 140.—Electrical Equipment of Gasoline Automobiles.—Which type of electrical equipment is better for gasoline automobiles, to have the electric starting, lighting and ignition combined in one system, or to have a separate outfit for each purpose? What are the advantages of each plan?—C. B. W., St. Joseph, Mich.

I have noticed the answer of R. L. L. to question No. 140 published in your June 28 issue and wish to add a few points which apparently have not been given due consideration. At the present time the electric lighting and starting of automobiles is more or less in its infancy in regard to the number of cars so equipped and relative to the number which will be so equipped in the future, but it is past the experimental stage. Exhaustive tests and experiments heve been conducted by the manufacturers of such outfits with the view of determining the most practical and efficient operation voltage. The complete equipment is highly efficient, and is more than simply "something which will get by". If any part were weak or did not have sufficient capacity this would not be true, as any equipment is no stronger than its weakest part. The majority of starting and lighting sets are either six or seven volts, and it is safe to say that if six and seven volts were not the most practical, taking all things into consideration, the engineers of these companies would have decided upon some higher voltage. The advantage of higher voltage in allowing the use of small wires is only apparent. A small wire will not stand the wear and tear to which it is subjected and will soon be broken, thereby causing trouble and dissatisfaction with the system. It is, of course, advisable to use a large wire with a higher voltage system to give strength, and also to eliminate any drop in voltage at the lamp socket. The use of a 12 or 18-volt system adds considerable extra weight to the car which is objectionable. When series wiring is used, the old objection arises that when one lamp burns out, the whole circuit is out. However, many cars are wired with the rear lamp and speedometer lamp in series. This is an immediate and silent signal to the driver when the rear lamp burns out. The system which will be used on a large number of cars for 1914 is the single-wire (grounded) system. This permits the use of a single large conductor to the lamp socket, thereby strengthening the wiring throughout, especially at its weakest part—the lamp socket. This method greatly simplifies the wiring, and in no way interferes with the ignition. A few prominent cars are using this method of wiring on their 1913 models, and it is possible that nearly fifty per cent of the 1914 models will be so wired.—W. G. G., Newark, N. J.

No. 146.—Ozonator for Direct-Current Circuit.—Are any ozonators built for use on direct-current circuits or is it necessary to connect them to the alternating-current side of a motor-generator or inverted rotary converter?—B. J. L., Cleveland, O.

Ozone is produced by an electrical discharge through air between two electodes or conductors. The high potential necessary for such a discharge may be obtained from the secondary of a properly designed induction coil, which is really a step-up transformer with an interrupter in the primary circuit to make and break the direct current, thereby inducing an electromotive force in the secondary winding on account of the change in the number of lines of force cutting the turns of the secondary winding. Whether such an ozonator has been put upon the market I do not know. The alternating-current device is, of course, simple because it does not require an interrupter.—V. A. R., Ansonia, Conn.

No. 147.—High-Frequency and High-Tension Tests.—(1) What is the highest frequency ever known? (2) In what year did Nikola Tesla conduct his high-tension tests in Colorado and what were the results? (3) What kind of machines were used?—A. M. E., West Medford, Mass.

(1.) Frequencies as high as a million r more cycles per second are known to occur in lightning, but such high frequencies are merely estimated for the most part. A frequency of a few hundred thousand is not uncommon in special tests. (2.) Mr. Tesla conducted his famous Colorado experiments in 1899. These experiments were begun in May of that year at Colorado Springs, and in June of the same year, his important results were obtained. His results were: (a) The development of a self restorative device for the control of a recording instrument, receiving transformer, and circuit for detecting the electrical disturbances; (b) he observed stationary waves. Mr. Tesla found the locality to be a very hot one and subject to frequent violent storms. As soon as he adjusted his apparatus, he found "the earth to be literally alive with electrical vibrations." He later, "noticed that the effect of distant disturbances was stronger on his apparatus than the effect of some local disturbances," and thus came to observe "stationary waves." (3.) The apparatus used included a receiving transformer, a sensitive self-restorative device controlling a recording instrument, an elevated terminal of adjustable capacity, and a ground, the arrangement being not entirely unlike the present-day wireless station cir-

cuit. He developed a magnifying transmitter which gave him a pendulum or harmonic effect. This was, "essentially a circuit of very high self-induction and small resistance, diametrically opposite to a typical Hertzian circuit." The observation of stationary waves, however, was the one big result.—P. E. E., Minneapolis, Minn.

(1.) Alternations of high periodicity, going to as high as 20,000 per second have been studied by Spottiswoode, and more recently by Tesla and others. (2) Nikola Tesla went to Pike's Peak, Colo., in 1899 to carry on a series of experiments in an effort to establish communication with other planets, and during the course of his trials, produced electrical flashes exceeding 100 feet in length, and electrical movements at rates of 110,000 horsepower, while his pressures ran as high as 50,000,000 volts. The only actual results of his long continued intimacy with the high potential was a periodical impulse received at his lofty station through space, with no explanation for it by Tesla himself or brother scientists other than electrical disturbances produced by earth currents, the aurora-borealis or the sun, and these three possibilities were not considered for an instant as the cause of the phenomena. (3.) The chief machine used during these highly dangerous experiments was an oscillator with capacity for producing electrical explosions of tremendous power. Tesla literature is exceedingly difficult to secure, as those that have it will not loan or sell same.—W. E. Rhodes, Boston, Mass.

No. 148.—Armature Band Wires.—What difference will it make in the action of a direct-current armature to use iron or steel wire or brass or bronze wire for banding? Would the iron wire have a tendency to shunt some of the magnetic flux from one pole to the other and thereby weaken the field?—F. E. K., Highland Park, Mich.

Steel or iron wire bands on direct-current armatures have a tendency to shunt the magnetic circuits. If bands are required or necessary hard brass wire is preferable. Later and more improved types of direct-current armatures have especially shaped slots to admit wedges or keys to hold the coils in the slots, thereby eliminating the necessity of bands and also large airgaps. Such improved machines have a greater efficiency on account of the smaller air gap required and a consequent stronger field.—V. S., Portland, Ore.

On several occasions I have directed to be used all of the bandings mentioned by F. E. K. and have experienced no trouble along these lines, i. e., weakened fields, and subsequent racing of armature. In one instance I rebanded a 15-horsepower 500-volt shunt-wound motor (bipolar) with iron wire, nothing else being available. No evil results followed this makeshift job. The machine ran for 20 days when I took the armature out and rebanded with the proper wire, or that most commonly used—a steel wire of 40 mils or a little less than one millimeter diameter, although many sizes are used from 18 mils up. I might add that one large manufacturer is now using in some instances phosphor-bronze bands, instead of binding wire. In conclusion, if F. E. K. has steel, bronze, or brass wire at hand, use it; if not, use iron. The only objections to iron wire that I can see lies in its inability to withstand the centrifugal strain.—A. E., West Medford, Mass.

The use of iron or steel is permissible as armature band wires and will have no great effect on the machine characteristics; phosphor bronze or aluminum bronze is superior to iron or steel on account of its lower temperature coefficient of lineal expansion, allowing the band wires to be made light without so much danger of their breaking or loosening up with changes in temperature. As the band wire does not cut across the flux with its length there would be no great amount of eddy currents generated in it and if made of steel the resultant small magnetic fields set up would be insignificant compared to the strength of the field. The reluctance of the band wires should be too high to have any amount of effect due to shunting of field flux around the armature. Phosphor, silicon and aluminum bronze also have a greater tensile strength than iron wire. But why use band wires when retaining strips are more efficient?—H. E. W., Chicago, Ill.

No. 149.—Why Do These Wattmeters Not Read Correctly?—We have in this plant two belted three-phase generators and a turbogenerator; any two or all can be synchronized. When the turbo unit is operating alone its wattmeter runs backward, but when in parallel with either belted unit the meters run forward, the indicating meter showing a large wattage at light load and the recording meter running fast; but under heavy load the indicating meter shows low wattage and the recording meter runs slow. The belted machines are rated at 75 and 150 kilowatts and the turbo machine at 100 kilowatts.—S. R. R., Macomb, Ill.

The recording wattmeter in the turbogenerator circuit is connected backward, that is, the line and load sides of the instrument have been interchanged. That this is so is proven by the fact that the meter runs backward when the turbogenerator alone is furnishing power independent of the other machines. This must also be true of the indicating instrument, although it is not directly stated. The reversal of rotation of the meter when the turbogenerator is running in synchronism with the other machines shows that under these conditions the turbogenerator, instead of furnishing power to the line, takes power from the other machines. This may be due to the adjustment of its governor (it is not stated how the three machines are governed when in synchronism) or to underexcitation of its field. At any rate, the turbo-alternator runs as a synchronous motor. The reason that a large wattage is indicated at light plant load is that under this condition the turbo machine takes more power than when the plant load is heavier. As the plant load increases the turbine governor either causes the turbine to supply more power to its alternator, or an increase in the field excitation of the latter causes it to act more nearly like a generator than a synchronous motor, thereby reducing its wattmeter reading. But it is evident that even then it acts as a drag on the other machines with which it is running in synchronism. The remedy is obvious. In the first place change the connections of the wattmeter and watt-hour meter so that they will indicate and run in the right direction, respectively, when the turbo-alternator is running alone. Then adjust the governors so that each prime mover will furnish its generator with enough power. It may be best to allow only one governor to operate for the three machines when they are running in synchronism. The field excitation of each machine should be adjusted until each produces its share of power. —V. A. R., Ansonia, Conn.

British Regulations Respecting Accuracy of Meters.

The British Board of Trade, which is a Government body, has made official regulations allowing the following limits of error for electric meters, the construction and pattern of which have already been or may hereafer be approved, and which belong to the classes of meters capable of ascertaining the value of the supply on direct-current or on single-phase alternating-current circuits.

Meters in which the maximum current for full load (*a*) does not exceed three amperes—the error at any point from one-tenth load to full load must not exceed 3.5 per cent plus or minus; (*b*) exceeds three amperes, but does not exceed 50 amperes—the error at any point from one-tenth load to full load must not exceed 2.5 per cent plus or minus; (*c*) exceeds 50 amperes—the error at any point from one-twentieth load to one-tenth load must not exceed 2 per cent plus, and at any point from one-tenth load to full load must not exceed 2.5 per cent plus or minus.

New Power Station of the Meriden Electric Light Company.

The current for street lighting, private lighting and most of the power for manufacturing purposes used in Merider, Conn., is furnished by the Meriden Electric Light Company from its new power station.

For the last few years the growth of industries in Meriden has caused a pronounced increase in the power output of the station and in 1911 it was seen that additional apparatus would have to be installed to meet the increasing demands for power, especially in boiler capacity. It was decided to abandon the old boiler equipment and install an entirely new boiler house and equipment and sufficient new turbine equipment to meet the needs of the plant.

The existing engine room with slight modifications and the removal of some compound-engine-driven units was adequate for the new steam-turbine equipment. As the available property was limited in width, the new boiler house was built at the end of the turbine room The foundations for both building and apparatus are of concrete carried down to rock or good bearing soil. The superstructure is a steel frame and brick building with artificial stone trimmings. Above the boiler firing aisle is a concrete and steel coal bunker of about 250 tons capacity. For the entire length of the building along the side of the bunker are copper louvres and below the louvres are inclined pivoted sash which give very good ventilation for the boiler room and provide an adequate amount of light in firing aisle, a feature that is often neglected in boiler-house design.

In the new boiler house are installed three Bigelow-Hornsby boilers each having a rating of 625 horsepower. Two of the boilers form a battery and the third forms half of a future battery, space being left in the building for this fourth boiler. Each boiler is equipped with a Foster superheater designed to give 125 degrees of superheat. The boilers are fired by Roney mechanical stokers. The stoker engines are arranged so that either of two can operate all the stokers.

The boilers as well as the auxiliary apparatus and piping are designed to operate with 200 pounds of steam pressure and 125 degrees superheat, but until some of the present apparatus in the station is replaced 150 pounds will be carried.

Each boiler is connected to a rectangular steel smoke flue which joins the stack base between batteries of boilers. Natural draft is furnished by a brick-lined self-supporting steel stack nine feet in diameter and 150 feet high. The stack is supported by steel girders framed into the steel structure of the building. The stack is also used to support two large electric signs, one on either side of the stack. These signs are composed of letters 3 feet wide and the total length of the signs is about 100 feet. The signs are used for advertising the output of the plant, one reading "Use Electric Light" and the other "Use Electric Power".

The feed water for the boilers is heated in a National Pipe Bending Company's direct-contact or open-type feed-water heater. Two boiler-feed pumps were installed, one being a horizontal duplex pump and the other one being a turbine-driven centrifugal pump, each being large enough to feed all boilers. A Venturi meter tube is installed in feed lines between feed pumps and boilers. The flow is registered on a registering, indicating and recording device calibrated in pounds of water per hour. This gives a very close record of the amount of water evaporated.

The high-pressure steam piping is made up of welded flanged steel pipe, cast-steel fittings and steel gate valves with Monelmetal trimmings. All valves two inches and under are bronze-body globe valves with nickel seats and disks. The condensation from the high-pressure steam lines is returned to the boilers by means of a Holly gravity-return system. All steam and hot-water piping is covered with 85 per cent magnesia sectional covering. Removable flange covers and valve covers are provided on high-pressure steam pipes so that any joint or valve may be inspected or repaired without injury to covering. All pipe lines are painted with a distinctive color for each system so that they may be readily identified.

As coal is supplied by railroad, a reserve supply is needed and this is taken care of by outside storage. Coal is received in hopper-bottom cars and dumped into a hopper underneath the siding. From this hopper it is crushed and elevated to a pile on the ground, from which it is picked up by a grab bucket worked from an overhead monorail hoist and distributed either to storage area or to coal bunkers. The monorail hoist has two-5-horsepower trolley motors and two-37-horsepower hoist motors. The grab bucket used is a clam-shell-type digging bucket. The monorail beams are 50 feet above ground level. The hoist has a travel speed of 300 feet per minute and a hoisting speed of 100 feet per minute. Between 25 and 30 tons of coal can be taken from storage to bunker per hour. From the bunker the coal is fed to the stokers through spouts.

The ashes from stokers are discharged into concrete ash hoppers and then into cradle dump cars. The cars are manually wheeled to end of plant and dumped into a pit underneath the monorail. The same monorail grab-bucket hoist that handles coal takes ashes from this pit to a concrete ash-storage bin in the yard under one of the monorails and from this bin ashes are loaded into trucks by gravity and carted away.

The generating equipment of this station consists of 350 kilowatts in direct-current engine-driven units and 3,000 kilowatts in alternating-current turbine-driven units. The recently installed generating unit is a 1500-kilowatt turbine-driven unit, the turbine being of the bleeder type, manufactured by the Westinghouse Machine Company. The bleeder connection of this turbine was left out and a connection from the auxiliary exhaust-steam lines is installed so that any excess exhaust steam not used for heating feed water, may be used in the low-pressure stage of turbine.

Directly under the turbine is placed a LeBlanc jet condenser. The only available condensing water in Meriden is a small brook which at times runs very low and hence supplies enough condensing water for only about half of the time. To take care of cooling water at times of low water in the brook, a Wheeler-Barnard forced-draft cooling tower is installed. The power for the fans of the cooling tower is furnished by a 30-horsepower motor belted to fan shaft. The piping from the condenser is arranged so that water may be used either from the brook or from the cooling tower. The cooling tower is designed to cool sufficient condensing water to give 27 inches of vacuum at the least favorable atmospheric conditions liable to occur in Meriden.

The switching equipment for this station is of remote-control mechanically operated oil-switch type with non-automatic oil circuit-breakers on the generators and automatic circuit-breakers on the feeders. The current is generated at 2,200 volts, 60 cycles, two-phase, and excitation is furnished by either a 25-kilowatt turbine or 25-kilowatt motor-driven exciter set.

The lighting and power for station use is taken from seperate transformers connected to the main bus by common oil switch. The lighting is a 220/110-volt tungsten system.

Provision has been made in both building and equipment to permit of future extension as the load increases, and on available property there is sufficient space to take care of the load for many years with the present rate of increase.

The extension of this plant was carried on while the plant was in regular service. Westinghouse Church Kerr & Company were engineers for the entire work and installed the apparatus.

From 225,200 short tons of low-grade copper ore in Maryland and Pennsylvania there was an output in the year 1912 of 549,022 pounds of copper.

Modern Methods of Lighting.

In a paper presented before a recent meeting of the American Society of Mechanical Engineers at Boston, Albert L. Pearson, electrical engineer for Lockwood, Greene & Company, Boston, brought out some interesting points relative to lighting. There are a great many systems of arc lighting in use today, he said, and some of them quite satisfactory. The open-carbon arc used with high-voltage direct-current generators has been displaced in general by the inclosed-carbon arc operated in multiple on low-voltage direct or alternating-current circuits. The intensified-carbon arc is doubtless the best of this class of lamps and due to its design the principal objections to the other types of arcs are practically overcome; there is the "traveling" of the arc around the crater causing varying shadows and the change in position of the arc relative to reflectors, thus interfering with the working of any well planned scheme.

Flame arcs are not generally used indoors except in foundries, machine shops with very high roofs or similar places. The light is very penetrating, thus making the lamp an excellent one for smoky places.

The mercury arc is finding a place in machine shops and textile plants, meeting with great favor in the silk industry. The principal objection to this lamp is the color of the light—a cold green.

This lamp possesses two distinct advantages—great diffusion of the light due in a large measure to the fact that it emanates from a line rather than a point and the line distinction or clearness with which threads or lines may be distinguished.

I believe that it has been proven that this light does not produce injurious effects upon the eye. The following statement is taken from a report on tests made by C. H. Williams, and Dr. Louis Bell upon a number of persons who have worked in the light of this lamp.

"In comparing all the cases examined the fact which stands out most distinctly is that in no case does a careful ophthalmoscopic examination show signs of trouble with the optic nerve or retina which cannot be more properly attributed to other causes. In no case was any pathological change found in the crystalline lens or the transparent media of the eye, not even where there have been years of work under the most trying conditions possible, where the men were day after day facing the glare of scores of lighted mercury-vapor tubes on the racks of the testing room. Immediately after leaving work under the mercury lamp color fatigue was clearly observable, as was to be expected. The fatigue is merely temporary and was least noticeable in some of the cases who had worked longest under the light, as if the eye had acquired a certain degree of immunity to the unusual stimulus."

A fluorescent reflector is being developed which is intended to supply the missing red rays to a certain extent and thus make the light more natural. A new form of this lamp is being developed the quartz tube of which will compete with the flame arcs.

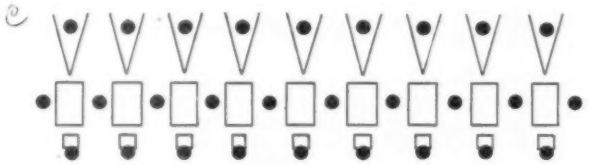
The luminous, or magnetite arc is not used indoors. This is replacing carbon arcs for street lighting and is used only on constant-current direct-current systems.

Of the incandescent class the tungsten-filament lamp is the most efficient, 1.25 watts per candle as against 3.6 watts for the carbon lamp. The tantalum lamp falls about midway between these two for efficiency, 2.0 watts per candle. In its present high state of development, the tungsten lamp is practically free from early defects. This lamp works equally well on alternating or direct current while the tantalum lamp gives best service on direct current. Alternating current produces the effect of repeated blows and the filament breaks in a short time, higher frequencies having worse effect than low. This lamp, therefore, should not be used on alternating-current systems.

In addition to its efficiency the quality of light from the tungsten lamp is superior to that of other illuminants of this class, most nearly approaching the ideal. This lamp is the greatest competitor of the mercury arc, and is being adopted as the standard of best practice for incandescent systems.

It is only during the past few years that attention and careful study have been given to the proper arrangement of lighting systems.

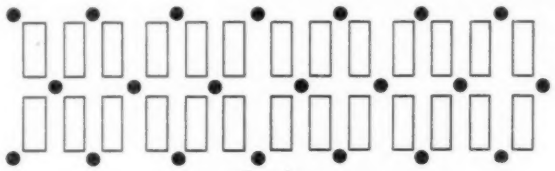
There are a number of fundamental principles which should always be fol-



Beamers

These Lamps 40 Watt Tungsten, Installed 8' above Floor with Extensive Type Reflectors.

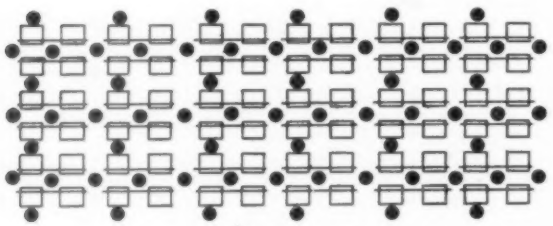
Arrangement of Lamps for Lighting Beamers.



Cards

These Lamps 40 Watt Tungsten, Installed 10' above the Floor with Extensive Type Reflectors.

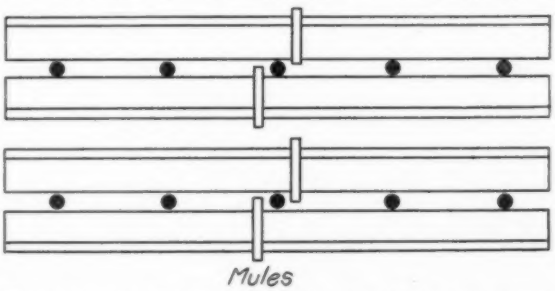
Arrangement for Cards.



Looms

These Lamps 40 Watt Tungsten, Installed 8' above Floor with Extensive Reflectors.

Arrangement of Lamp for Looms.



Mules

These Lamps 100 Watt Tungsten, Installed 12' above Floor Extensive Type Reflector.

Arrangement of Lamps in Spinning Room.

lowed in making a lighting layout.

As the operative is the one for whom the light is provided, he should be given every consideration.

Lamps hung low down which can be adjusted by the operative should be avoided wherever possible. Not only is he liable to experiment with the lamp and waste time but may interfere with the work of other operatives.

Lamps should be arranged to give uniform illumination at the working plane, avoiding shadows as far as possible and particular attention should be given to the requirements of each machine.

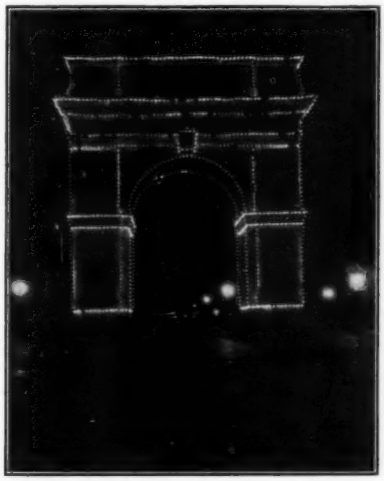
White walls and ceilings are advantageous and add to the effectiveness of the lighting systems. With individual drives of machines it is possible to keep the rooms cleaner than with mechanical or group driving, thus benefiting the lighting system.

On account of glare, low exposed units should be avoided. In places where it is necessary to have the lamps low down, reflectors which will entirely conceal the filaments should be used. In such cases it is usually necessary to provide lamps close to the ceiling for lighting shafting, etc. and to overcome the effect of light and darkness.

The position of lamps should be carefully determined, both as to spacing and mounting height. In general the height of the lamp above the floor should be such that with the spacing available the lines representing the angles of maximum illumination with a given type of reflector will cross at the working plane.

Each problem must be considered by itself. A system of illumination which works out well in one case may be anything but what is best suited for another.

The accompanying diagrams illustrate layout which have been found to work out well for several of the processes in a cotton mill. It will be noted from these that the best lighting is provided for the most particular process—weaving. The amount of light and arrangement of lamps depend upon the nature of the work and character of the machines.



Washington Memorial Arch.

There are a number of points in favor of good lighting:

(1) Safety; (2) better sanitary conditions; (3) better quality of work and increase in production.

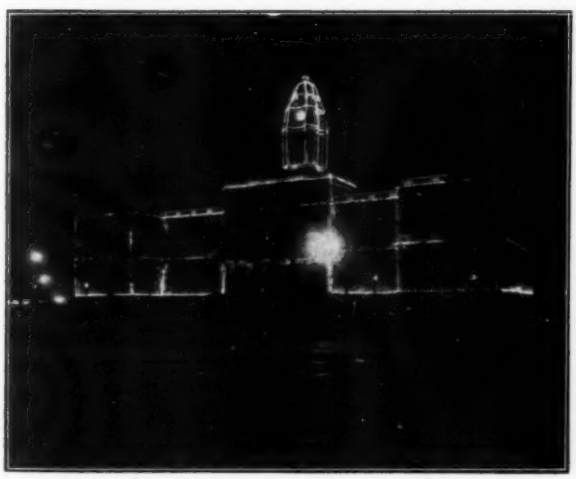
In places where very good light is not required or where it is used for comparatively short periods of time obviously, it does not pay to invest as much for this part of the equipment as in places where it is required for long periods or is depended upon for quality of work.

Lighting systems cannot be worked out as formerly—so many watts or candlepower per square foot—but a study must be made of all conditions.

New York City Substitutes an Electrical Display for Fireworks on the Fourth.

In the movement for a sane Fourth of July celebration, the City of New York took an early lead, and for the first time since that city began celebrating a safe and sane Fourth this year no money was spent for fireworks. Instead of the pyrotechnic displays the committee appionted by Mayor Gaynor decided to omit them entirely in favor of electrical illuminations in the various public parks and on public buildings and city monuments.

Arrangements were made for electrical illumination at 15 places in Manhattan and the Bronx. Seventeen thousand electric bulbs of eight candlepower each were used, making a total of 136,000 candlepower of illumination. The lights were burned on three nights, July 4, 5 and 6, from 7:30 P. M. until midnight. All of the current required for the illumination on these three nights was given to the city by the New York Edison Company, the only cost to the city being for the stringing of the lights, which was done by a number of private electrical contractors. The illumination of the city hall and the Bronx Borough hall was donated by the Edison Company, including the lights and wiring, without any cost to the city whatsoever. The decorations included the outlining of the building structures, outlining of the Washington memorial arch, thousands of lights strung through the trees, festoons from the pole lines, rows of Japanese lanterns extending along the driveways and avenues in the parks, pavilion outlining, and streamers from center poles in the park areas. The committee in charge of illumination consisted of William A. Johnston and Charles W. Price, representing the mayor of the city of New York.



City Hall.

Chelsea Park.

ADVERTISING IN THE TECHNICAL PRESS.[1]

By Charles L. Benjamin.

An advertisement of a food product, or other article of general consumption, appeals to every adult member of a community; but an advertisement of a steam-shovel, a concrete-mixer or an electric crane appeals only to the very limited number of persons in that community who deal in such machines, or who use them in their own business.

The daily newspaper, reaching as it does, the whole body of citizens, will include among its readers the few who would be interested in electric cranes, concrete-mixers and steam-shovels; but since the newspaper's advertising rates are based upon its total circulation, and since only an infinitesimal part of that circulation is of value to the technical advertiser, it follows that the technical advertiser cannot use the daily paper with profit.

For the same reason products similar to those named cannot be profitably advertised in magazines of general circulation. Here and there a product will be found which, while technical in its nature, is so widely used as to permit of general advertising; but a product which appeals only to a particular trade or profession cannot be profitably advertised in a medium that circulates among all classes of persons.

It is impossible to say what the percentage of effective circulation must be in order to justify the use of a given medium. No advertising medium is 100 per cent efficient. Food products are, perhaps, as universal in their appeal as any article that is advertised. Advertisements of dress goods and shaving soaps are approximately not more than 50 per cent efficient, when inserted in mediums of general circulation, since one appeals only to women and the other only to men. Advertisements of automobiles and investment securities are even more restricted in their effectiveness, since in the average community the great majority of persons cannot afford to purchase either. It seems quite possible that an advertiser may sometimes be justified in paying for 75 per cent, or even 80 per cent, waste circulation for the sake of reaching the 20 per cent, or 25 per cent, of possible customers; but not even one per cent of the readers of a daily paper use electric cranes or concrete-mixers, not even one-half of one per cent of the readers of magazines of general circulation use steam-shovels.

The problem of the technical advertiser is not unlike that of the mining expert. It is the business of the one to satisfy himself not only that the metal sought exists in the mine under investigation, but that it can be extracted at a cost that will leave a profit after deducting operating expenses. It is the business of the other to satisfy himself not only that among the readers of a given publication there are *some* possible customers, but that the percentage of possible customers is sufficiently large to justify the use of the advertising medium under consideration. For this reason the technical advertiser turns to the trade paper, for here there is practically no waste circulation to be paid for—nearly every reader is a possible customer.

A man eats what he likes and wears what he pleases, within the limitations of the fashions prevailing in his own age and country, but in all other matters he is guided by the opinions of other men. What do you or I know, personally, of the stars or planets? Only what astronomers have taught us to believe.

We believe the earth is approximately 93 million miles distant from the sun because the small group of men who know most about such things say it is. If you want to alter my opinion on that point, don't talk to me—convince the astronomers and I will accept their verdict.

Ask any one of this audience to name the greatest of English dramatists and the answer will be: "Shakespeare". Ask him if he has read *all* of Shakespeare's plays and he will probably answer: "No". Most of us have read only some of them. Ask him if he has read Christopher Marlowe's plays, Ben Jonson's, Ford's, Beaumont and Fletcher's, and the answer will again be: "No". Ask him if he has read the long line of English plays that lie between "Arden of Feversham" and "The Gay Lord Quex" and he still answers: "No". Yet he is firm in his belief that Shakespeare is the greatest of English dramatists.

Why?

Because the men who *have* made a study of English drama rank Shakespeare first.

Most of us possess first-hand knowledge of only a few things. On all matters outside of our own specialty we accept the opinion of other men—men who are, themselves, specialists in matters of which we are ignorant.

The technical advertiser, knowing that it is thus men's minds are molded, strives to win for his product the favorable opinion of those who are the recognized authorities in the particular field to which the thing advertised appertains.

How can these men be reached?

Through the pages of the technical paper. The men who know most about any technical subject are either editing trade journals, or contributing to them, or reading them.

The population of the United States and Canada exceeds 100 million persons. The combined circulation of all the electrical trade journals published in the two countries does not exceed 100 thousand.

I want to win for the electrical apparatus I am advertising the favorable opinion of the 100 thousand. These are the men to whom the 100 million will turn for advice when in the market for electrical apparatus. I can't afford to educate the 100 million, and I don't have to. All I have to do is to convince the 100 thousand and they will hand the rest of you your opinions ready-made.

In what I have just said I do not mean to depreciate the value of what is called "consumer advertising".

But Get Your Trade With You First!

There is no use in sending a would-be consumer to a dealer, to an architect, to a consulting engineer, to a physician, who will not back up with his personal influence the good impression created by the advertisement. The best that consumer advertising can do it to create a favorable impression. Whether that impression crystallizes into conviction or not depends, not upon what you say, but upon what is said by the men who mold public opinion in your line of business.

The less technical the product the more effective consumer advertising is likely to be. You may venture to use your own judgment in the selection of bathroom fittings for your new house, but you are not apt to go contrary to your architect's advice as to the type of heating system that shall be installed. Your wife may make up her own mind as to whether direct lighting, indirect lighting or semi-indirect lighting shall be used in the dining room and parlor, and she is likely to select the fixtures herself, but she is not likely to specify the kind of reflector that shall be used, and she will leave wholly to the good judgment of the electrical contractor the determination of the type of fuse cabinet and switchboard to be installed in the basement or attic.

One of the problems of the technical advertiser is to decide whether his appropriation shall be spent wholly in trade publications, or partly in mediums that reach the consumer. With a small appropriation it is best to concentrate in the trade papers. With a large appropriation, cover the trade-paper field first, then branch out cautiously in mediums of general circulation—always provided that the thing advertised possesses the element of popular appeal.

An electric flat-iron may be profitably advertised both in a technical and in a popular way, but I doubt whether any advertising man will ever succeed in making a dynamic brake resistance, or a hatchway limit switch, of interest to the general public.

The first problem a technical advertiser has to solve is the problem of

[1] An address before the convention of the Associated Advertising Clubs of America, Baltimore, Md., June 11, 1913.

mediums. He must know the publications that reach his trade, or the particular branch of his trade to which the thing advertised appeals. The second problem is the problem of copy, and here the technical advertiser is more restricted than the advertiser of some product of general consumption. Generally speaking, there are two classes for whom the technical advertisement is designed. It is either designed to appeal to the user of the apparatus advertised, or to the dealer in that class of apparatus, this paralleling the general advertiser's division into dealer and consumer advertising.

Compared to general advertising the progress made in technical advertising within recent years has not been so great, partly because the need of more effective advertising has not been so keenly felt by manufacturers of technical products as by manufacturers of articles of general consumption, and partly because the abler advertising men have flocked to the general field which, as a rule, is more remunerative. I mean by this that an experienced advertising man can handle a number of general accounts, where the whole story to be told can be secured in one interview, whereas a technical advertiser must often devote his whole time to mastering the details of one business.

The general advertiser has a freer hand when it comes to illustrating his product, for he can show food or clothing being consumed or worn by various members of his family, he can use attractive living rooms for background, he can enlist the aid of the child picture and the pretty girl, he can lay the scene of his automobile or motor boat advertisement in the woods, or at the seashore, but the technical advertiser can seldom get away from the factory and the man in blue jeans.

The general advertiser has more freedom in preparing his copy, for the consumer is not familiar, as a rule, with the details of manufacture, or the differences in various grades of material, whereas the consumer of technical products knows the thing advertised, or the competitive article, oftentimes as well as the advertisement writer himself. Hence it comes about that there is the same difference between general advertising and technical advertising as between a political speech and the argument of a patent attorney appearing in an interference case before the Commissioner of Patents. A politician can appeal to the patriotism, to the loyalty, to the pride of his auditors, he can enthuse them by the power of eloquence to action; he can paint glowing word pictures which, if they were analyzed, might be found to contain more fancy than fact; but the attorney arguing an interference case before the Commissioner of Patents cannot rely on any of these things. His case stands or falls by the bare cold facts that he is able to muster. In the same way a technical advertiser is obliged to blue pencil the rhetoric and convince his readers by the weight of the evidence he is able to marshal to his support. This does not mean, however, that technical advertising cannot be made interesting. As a matter of fact, I know of no field so full of good material for the advertising man.

Consider for a moment in what the interest of technical journal consists. Take any trade or technical publication and, omitting the personal and business notes, you will find that the interest consists in articles descriptive of new methods of manufacture, or in improvements or modifications of old methods, or in installations which are of interest because of their size, or because of the economies effected. Nearly all of this news comes primarily from the manufacturer. He is the man who developes new machines and new methods. He, or his agents, are the men that build and equip the new plants. To him come the reporters of the technical papers for data and for illustrations. In other words, the manufacturer furnishes the raw material out of which the reading pages of trade journals are made; and yet this same man, when preparing copy for an advertisement of his own, will often content himself with printing the name of his own company and a list of its products, being unable to think of anything else to say. There is no reason why the advertising pages of the technical paper should not be as interesting as the reading pages; no reason except that many of our technical advertisers have not yet discovered that it takes one type of mind to design and construct machinery and another type of mind to design and construct advertisements.

Let me try to give you a concrete example of the working of these two types of minds. Here is a manufacturer who is turning out a first class wheel-barrow for contractors' use. He sees in the technical papers, advertisements of competitive wheel-barrows and feels that he, also, should advertise; but when he takes a pad of paper and a pencil and attempts to write an advertisement of his wheel-barrow he can think of nothing to say about it. His wheel-barrow looks very much like any other wheel-barrow. There are a few minor differences which he believes make his produce superior to the others. The prices are about the same, or possibly, being the better barrow his price is higher than that of his competitors. But—how can a man write an interesting advertisement about so ordinary a thing as a wheel-barrow?

Put this problem up to an experienced man and his mind will work something lige this:

"A wheel-barrow?—A *wheel*-barrow? Why is this thing called a *wheel*-barrow? Obviously because prior to the time wheel-barrows existed there must have been a thing called a barrow—a barrow without a wheel".

Get down your encyclopaedic dictionary and verify this supposition. Yes, before the days of the wheel-barrow there was a thing called a barrow. It consisted of a box with two poles attached to its sides and extending beyond the box in each direction so that two men, one before and one behind, could pick up the box with its contents and carry it to the spot where the material was required. the manner of carrying it being similar to the method of carrying a sedan chair You can see this primitive type of conveyor still used today by laborers on the streets. Very often the carrier portion is a tub or cask that is used for conveying water for mixing lime or cement when no hose or hydrant is handy. The barrow, then, was the primitive conveyor of material. It required two men to carry it, one before and one behind. Then one day, how long ago no one knows, some forgotten genius said to himself: "Why would'nt it be a good idea to fasten a wheel between the front shafts so that one man, standing between the rear shafts, could trundle the barrow himself without requiring help?" The thing was tried and it worked. One man did the work that formerly required two men. There must have been thousands, perhaps, millions, of laborers employed in ancient times in carrying material from point to point by means of barrows. The wheel-barrow was invented and the cost of conveying material was at once cut in half. As a matter of fact the common everyday wheel-barrow is one of the greatest labor-savers ever invented.

Here is a good start for your advertisement. You have caught the attention of the reader, you have made the subject of wheel-barrows interesting. Now go on and point out that from the time the first wheel-barrow was made there has really been no radical improvements in wheel-barrows until you came along with YOUR wheel-barrow. Then tell what you have done to improve it, and why your wheel-barrow is the one that all contractors should use.

Receivers Appointed for American Water Works & Guarantee Company.

On Monday morning, July 7, the First-Second National Bank of Pittsburgh failed to open its doors and announcement was made that the bank had been closed by the acting controller of the currency and C. C. Murray appointed receiver.

Upon petition of F. G. Glover and Elizabeth M. Van Wagener, Judge Charles P. Orr, of the United States Court, appointed as receivers of the

American Waterworks & Guarantee Company, J. S. and W. S. Kuhn and J. H. Purdy. A fourth receiver may be appointed. The receivers gave bond in $50,000 each. It was alleged in the petition that the company is engaged in building and operating water works throughout the country and have 35 water plants. It is claimed that by reason of the failure of the First-Second National Bank of Pittsburgh that some preference might be made in the payment of creditors and for that reason a receiver is sought.

An application also was made to Judge Orr by J. Gordon North and Frank G. Glover for a receivership for J. S. & W. S. Kuhn, Inc., it being declared such action was necessary to conserve the interests of all alike under the circumstances that had arisen. J. K. Duff, treasurer of the company, was appointed receiver under a bond amounting to $50,000.

The American Water Works & Guarantee Company is the largest operating water works in the United States. It is also largely interested in irrigation projects, electric interurban and electric lighting enterprises. It always has been prosperous and has paid dividends of 6 per cent annually since 1889. The receivership was applied for to conserve its assets and protect its creditors and is expected to be of short duration.

Among the companies it controls are: Arkansaw Water Company, Little Rock, Ark.; Birmingham Water Works Company, Birmingham, Ala.; Belleville Water Supply Company, Belleville, Ill.; Butler Water Company, Butler, Pa.; California-Idaho Company, a development concern which owns land in the Sacramento Valley; City of New Castle Water Company, New Castle, Pa.; City Water Company, Chattanooga, Tenn.; City Water Company, East St. Louis, Ill.; City Water Company, Marinette, Wis.; City Water Works Company, Merrill, Wis.; Clinton Water Works Company, Clinton, Iowa; Connellsville Water Company, Connellsville, Pa.; Great Shoshone & Twin Falls Water Power Company, operating water powers on Snake River, Ida.; Huntington Water Company, Huntington, W. Va.; Joplin Water Works Company, Joplin, Mo.; Keokuk Water Works Company, Keokuk, Iowa; Kokomo Water Works Company, Kokomo, Ind.; Louisiana Water Company, Louisiana, Mo.; Monongahela Valley Water Company, Monongahela, Pa., and vicinity; Mt. Vernon Electric Light & Power Company, Mt. Vernon, Ind.; Mt. Vernon Water Works Company; Muncie (Ind.) Water Works Company; Portsmouth, Berkeley & Suffolk Water Company, which supplies Portsmouth, Norfolk and other Virginia cities; Racine Water Company, Racine, Wis.; Sacramento Valley Irrigation Company; St. Joseph (Mo.) Water Company; Shreveport (La.) Water Works Company; South Pittsburgh Water Company; Twin Falls (Idaho) North Side Land & Water Company; Twin Falls Oakley Land & Water Company; Twin Falls, Salmon River Land & Water Company; Wellsville (N. Y.) Water Company; Warren (Pa.) Water Company; Wellsville (N. Y.) Electric Light, Heat & Power Company; Wichita (Kans.) Water Company.

The officers of the First-Second National Bank, of Pittsburgh, are W. S. Kuhn, president, and J. M. Young, William McConway and Oscar L. Telling, vice-presidents. Mr. Young is also cashier.

W. S. Kuhn is also vice-president of the American Water Works and Guarantee Company, of which J. S. Kuhn is president. The company controls water-works plants in about eighty cities and towns in the United States. The capital stock of the various controlled companies is about $37,000,000.

The Kuhn interests have centered largely of late in irrigation projects in the West. They also control the West Penn Traction & Water Power Company, a combination of trolley-line interests in Western Pennsylvania, and the operations of a group of bituminous mines in this state, especially the United Coal Company, of which W. S. Kuhn is president and director.

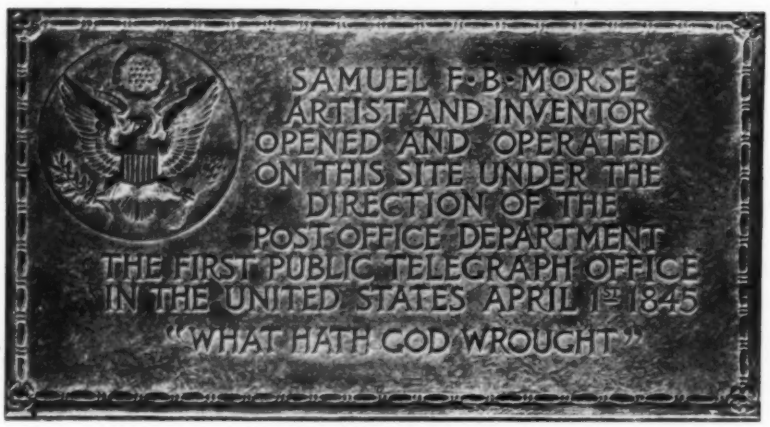
Other interests of W. S. Kuhn are Colonial Trust Company, of Pittsburgh, Commercial National Bank and Commonwealth Trust Company, of Pittsburgh, in all of which he is a director; vice-president and director Pittsburgh Bank for Savings; president and director Kittanning & Leechburg Railway Company; president and director Sacramento Valley Irrigation Company; president and director Twin Falls North Side Land & Water Company.

The First Public Telegraph Office.

A bronze tablet, 16 by 30 inches, designed by Henry Bacon, the eminent New York architect, to mark the site of the first public telegraph office in the United States, has been placed on the wall of the old Post Office Department building on Seventh Street, N. W., between E and F Streets in Washington, D. C., and was dedicated, with suitable ceremonies, on July 4. Representatives of Congress, the Treasury Department, Post Office Department and of the District Government, took part and appropriate addresses were made.

On the same day there was dedicated a similar tablet, placed on the south side of the same building, which was the location of Blodget's Hotel, where Congress convened in 1814.

The erection of these tablets is in pursuance of a plan adopted 15 or 20 years ago for marking important historic sites in the District of Columbia. It has been the custom, on the occasion of presidential inaugurations, to place temporary markers on many points of interest and this has been followed by permanently marking a few of the most important points.



Tablet Marking Site of First Public Telegraph Office.

The unveiling ceremonies were conducted by William V. Cox, chairman of a committee appointed by the Commissioners of the District of Columbia.

Marcus Benjamin, editor of the publications of the National Museum, explained the work of the committee on historic sites. An address on the Blodgett Hotel site was delivered by Caleb C. Magruder, Jr., a prominent Washington lawyer. The address on the telegraph office site was given by George C. Maynard, of the National Museum. Among the prominent persons present were Mrs. Lelia Morse Rummell, daughter of Professor Morse, her son William Morse Rummell and his wife, the family of a nephew of Morse, representatives of the family of L. D. Gale and James J. Clark, one of Morse's intimate associates in the early days.

New Electrical and Mechanical Appliances

Tests of Alexalite Indirect-Lighting Unit.

A series of tests of a 24-inch Alexalite indirect-lighting unit sold by the Central Electric Company, Chicago, was recently made in the Electricity Lecture Room at Armour Institute of Technology, Chicago. The dimensions of the room are 23 feet by 27 feet 7 inches; the height is 14 feet 6 inches. The ceiling is a cream-white color and the walls are dark tan. Considerable space on the walls is taken up by blackboards. The indirect unit was hung in the center of the room. It was provided with a 500-watt spherical tungsten lamp taking 4.25 amperes at 112 volts during the test, so that the actual power consumption was 510 watts. The tests were made with a Sharp-Millar photometer.

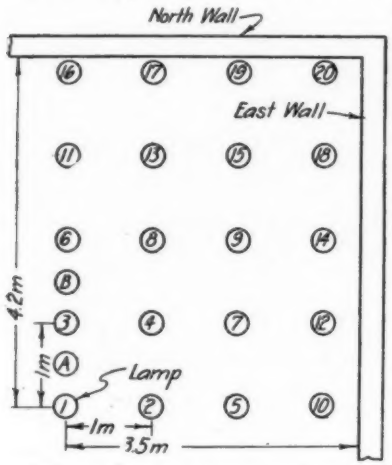


Fig. 1.—Location of Test Stations.

In the first test one quarter of the room was divided off into 20 sections, with as many test stations at the center of sections, as shown in Fig. 1. These stations were one meter apart in both the north-south and east-west directions. Illumination readings were taken on a working plane 31 inches above the floor. The average illumination intensity was found to be 1.74 foot-candles. The effective flux of the unit was 1.105 lumens, thus making the lumens per watt on the working plane 3.17, an exceptionally high value. The actual illumination readings varied from 3.41 foot-candles at the station directly beneath the lamps to 0.57 foot-candle at the most remote station in the corner of the room. Fig. 2 shows the distribution in the north-south direction.

In the second test similar observations were made at the same test stations, using a bare lamp without the indirect reflector or diffuser. It is interesting to note that the intensity directly beneath the Alexalite is practically the same as with the bare lamp.

In the third test observations were made at two stations one directly beneath the Alexalite unit and the other one meter north of this. Tests were made at three different heights of the test plane above the working plane. The first one with a height of 31 inches gave 3.41 and 3.17 foot-candles, respectively. The next test, with a test-plane height of 76 inches, gave 7.70 and 6.0 foot-candles. The third test, at a height of 117 inches, gave intensities of 15.0 and 11.0 foot-candles respectively. As shown by these readings and by the preceding tests, the illumination is highest directly under the unit, regardless of the height of the working plane.

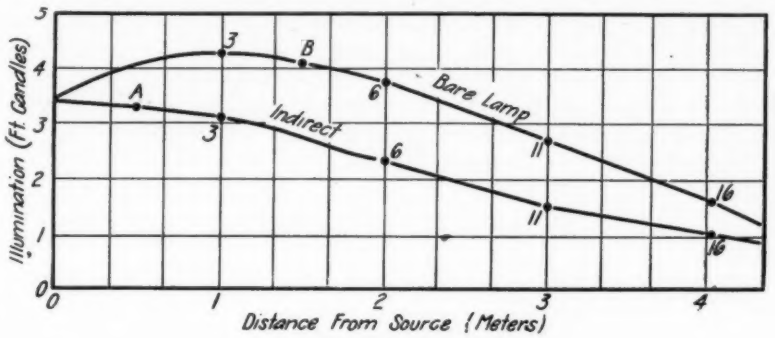


Fig. 2.—Illumination Distribution.

Some Uses of Storage Batteries Not Generally Known.

The remarkable accomplishments of electricity are too well known to require comment, but many readers do not appreciate the variety of uses of storage batteries and the extent to which they are reliably applied.

The Crocker Land Expedition under the auspices of the American Museum of Natural History, the American Geographical Society, the University of Illinois and other institutions, is about to sail from New York City to explore the north polar regions. One of the interesting features of this expedition's equipment will be a complete electric lighting plant which will be installed in a portable house at about 80 degrees north latitude. This plant will be equipped with an Ironclad-Exide storage battery so that light will be available at all times and it will only be necesasry to run a kerosene engine occasionally to charge the battery. The electrical apparatus of this expedition will be in charge of Ensign Fitzhugh Green, U. S. N. This battery will be composed of 20 trays, the whole weighing 1,720 pounds and having sufficient electrical capacity to light 115 eight-candlepower lamps for 10 hours. This type of battery was chosen on account of its reliability, light weight and its ability to give good service at very low temperatures.

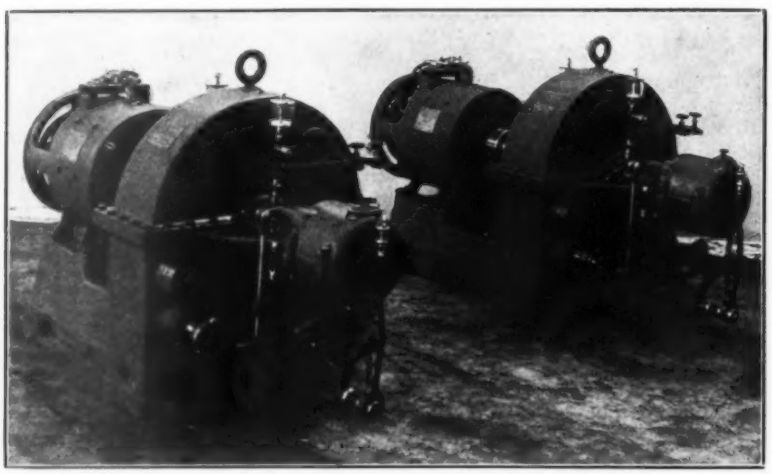
The digging of the Panama Canal, which is approaching completion, has been done largely by electrical machinery in connection with which storage batteries have been used. The batteries chosen for this service by the United States Government engineers have been of the type known as the Chloride Accumulator and even at the high temperatures experienced in this tropical region have given most satisfactory service. The Chloride Accumulator is also used in connection with wireless apparatus, as well as for electric lighting and power service. These facts demonstrate that storage batteries of the proper types will operate satisfactorily in either very cold or very warm climates.

The United States Government in its various departments has extensively studied and experimented with storage batteries and utilized them for numer-

ous purposes. Submarine boats of the navy, when submerged, are propelled through the water by current furnished from storage batteries. Twenty submarine boats of the navy are equipped with Exide batteries, similar batteries being also used for gun-firing. Battleships and cruisers also use storage batteries for firing large guns and depend upon them for the emergency operation of wireless apparatus. Vessels of the navy as well as fortifications on land are provided with storage batteries as an emergency outfit for furnishing electric lights. In the post-office service and at many navy yards the Government uses electric trucks and other motor cars propelled by storage batteries. For all these government services the storage batteries manufactured by the Electric Storage Battery Company, of Philadelphia, are used.

For electric-vehicle service Exide, Hycap-Exide, Thin-Exide and Ironclad-Exide storage batteries are most extensively used. These batteries have different characteristics so that with one of the four it is possible to meet any demands of electric-vehicle use. Exide batteries have for years been standard equipment with nearly all electric-vehicle makers.

The Electric Storage Battery Company is the oldest and since its organization has remained the largest storage-battery maker in the country. It is a progressive company, having a service organization extending throughout the country at the disposal of storage-battery users; it is continually the desire of the company to consult with and help any one who uses storage batteries for any purpose.



Two Turbogenerator Sets for Naval Service.

Compact Turbogenerator Units for Naval Service.

Certain classes of marine service demand electric generating sets of high efficiency with minimized weight and dimensions. This class is perhaps best represented by torpedo-boat destroyers, in which space and other important features are sacrificed in favor of speed to a marked degree.

The accompanying illustration shows two 10-kilowatt turbine-driven generators recently supplied in accordance with United States Navy requirements for destroyers. The generator of each set was manufactured by the Diehl Manufacturing Company, of Elizabeth, N. J., and the turbine by the Terry Steam Turbine Company, of Hartford, Conn.

The generator is a direct-current machine rated at 10 kilowatts and 125 volts when run at 3,600 revolutions per minute. The regulation provides for no more than two volts variation between no load and full load. The guaranteed temperature rises in centigrade degrees after a four-hour full-load run and after a two-hour run at 33.3 per cent overload are respectively as follows:

Armature, 22.5 and 24.5 degrees; commutator, 21.5 and 25 degrees; shunt field, 21 and 21.5; interpole coils, 17.5 and 20; bearings, 30.5 and 25; field rheostat, 30.5 and 23 degrees; in each case the temperature of the cooling air is assumed to be 25 degrees.

The turbine is to operate normally at 200 pounds steam pressure and to exhaust anywhere between 26 inches vacuum and 5 pounds back pressure. The guaranteed steam consumption is 53.8 pounds per kilowatt-hour at full load. The weight of each set complete is 1,350 pounds.

A New Form of Electric Advertising Sign.

A rather interesting application of a well known principle has been adopted in connection with a series of illuminated signs which are made by the Tress Company, of London, England. These electrical signs have a very effective and novel movement by means of which the illuminated letters gradually diminish in size, while at the same time they keep their correct spacing and proper proportions, finally disappearing altogether. They then gradually reappear and expand to their full dimensions. The accompanying illustration represents a typical sign with the appearance of the letters in various succeeding stages, in order to show the appearance of the sign at various portions of the cycle of operations. As the sign is a flat one and there is obviously not sufficient room within the sign for any optical projection device, it is difficult at first sight to explain its expanding and contracting effect, and hence the sign presents a great deal of attraction to the passer-by.

In construction, however, the sign is composed of variously shaped metal leaves which form letters on a ground of white opal. When at rest, the leaves, being fully expanded, form a sign of white letters against a dark background. The opening and closing of these metal leaves is obtained by means of a movement operated by racks and pinions operating in four directions, the motive force being either a clockwork movement or an electric motor. The principle underlying the opening and closing of the leaves is similar to the iris diaphragm of a photographic lens. When in operation the leaves gradually contract in proportion lessening the size of the white letters until closure is completely effected. When this has occurred the leaves commence to open again, gradually increasing the size of the letters until they reach the maximum and the process is then again repeated.

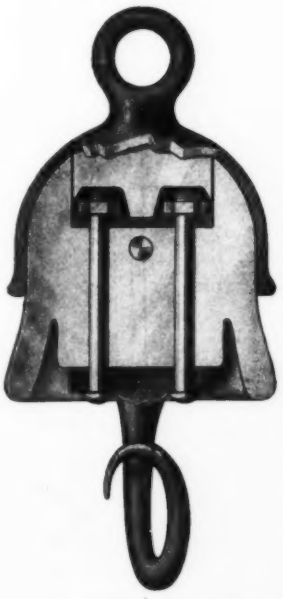
Unique Electric Sign.

The effect on the passer-by is that he is irresistibly impelled to watch the sign grow. It is a daylight sign, as well as for evening display, because its operation can be watched with interest in broad day. At night it is illuminated by electricity. The sign is made

either in a facia, hanging or swinging box sign, or in fact any convenient style. The letters and background may be of any color in strong contrast, and it is almost impossible to detect the method of operation by ordinary observation. The unique features of the sign therefore make it worthy of attention.

New Non-Drop Hanger for Arc Lamps.

Line Material Company, South Milwaukee, Wis., has added a new arc-lamp hanger to its numerous devices. In the accompanying cross-section illustration of the new hanger it will be noted that below the malleable-iron yoke which connects the two vertical bolts there is a transverse three-eighths-inch rivet. This rivet prevents the dropping of the lamp in case the insulation should be broken. The top is made of a single piece of malleable iron. There are no bolted connections or joints. The high insulation is said to resist a pressure of 20,000 volts. The pig-tail hook at the bottom allows the lamp to be hung with one hand.



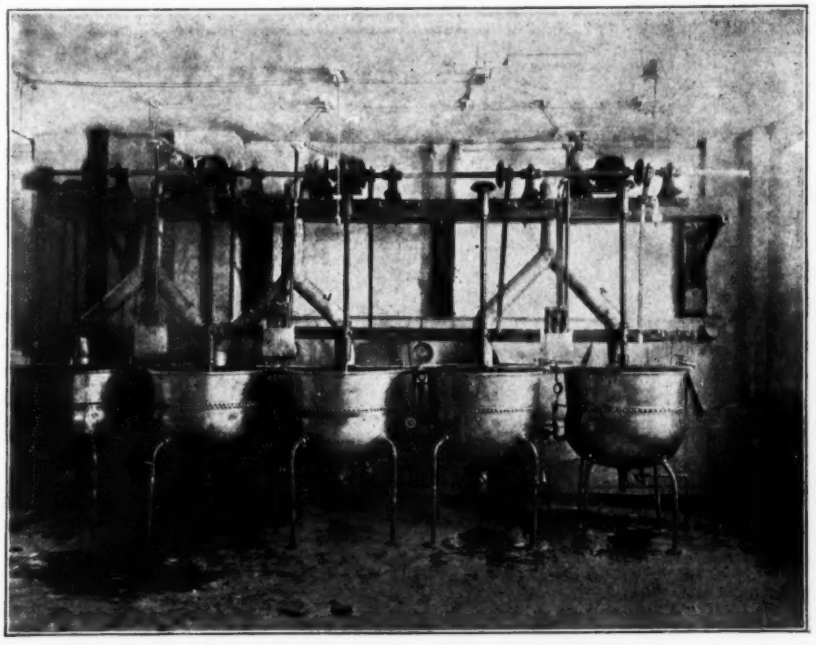
Partial Section of Non-Drop Hanger.

Another illustration of the use of this newly patented insulator is shown in which the channel arms, provided with the Hendee flexible clip, support the insulator at an angle which prevents binding of the wires when raising or lowering the lamp. This patented insulator support is used with a large variety of arc-lamp hangers.

Hanger Complete with Insulator Supporting Arms.

Watson Motors in the Candy Factory.

The accompanying illustration shows three one-half horsepower squirrel-cage Watson motors recently installed by the Mechanical Appliance Company, of Milwaukee, Wis., for operating exhaust fans in the candy factory of the George Ziegler Company, of the same city. These motors are direct connected to the fans which are used to exhaust the steam from the copper candy kettles shown. Each of the kettles has a vertical stirring rod which is driven by bevel gearing from a shaft above, which has nothing to do with the three exhaust-fan motors.



Motors Driving Exhaust Fans in Candy Factory.

In this same plant a large automatic lozenge machine has also been installed recently. This machine offers a load similar to a printing press. A five-horsepower slip-ring motor (with speed regulators) is mounted below the frame and drives a large cylinder by belt. This machine turns out about 17 barrels of these lozenges a day, or about 300,000. Another one-half-horsepower squirrel-cage motor does the work that formerly took a score of girls. This motor drives a machine which cuts long strips of caramel candy into separate caramels besides wrapping each up individually, ready for packing into boxes. The great extent to which electricity is used in candy factories today is in a large measure the reason for the higher standard of cleanliness now prevailing.

The Adnil Insulated Telephone.

The new portable telephone recently brought out by the London Adnil works is intended as a highly insulated and protected apparatus in which there will be no danger of shocks when used in certain special cases. Where the telephone wires run near high-tension electric wires, it may be required to carry out repairs on the telephone lines, in which case the current would not necessarily be cut off

from the high-tension line. It may also be desirable to speak from any point by tapping the telephone lines, during repair work or in other cases when alterations or other work which does not involve actual repairs may be carried out. In all such cases it would be a risky proceeding to use an ordinary portable telephone which is not specially insulated, as in case of the power circuit coming in contact with the telephone lines the telephone user would be in danger.

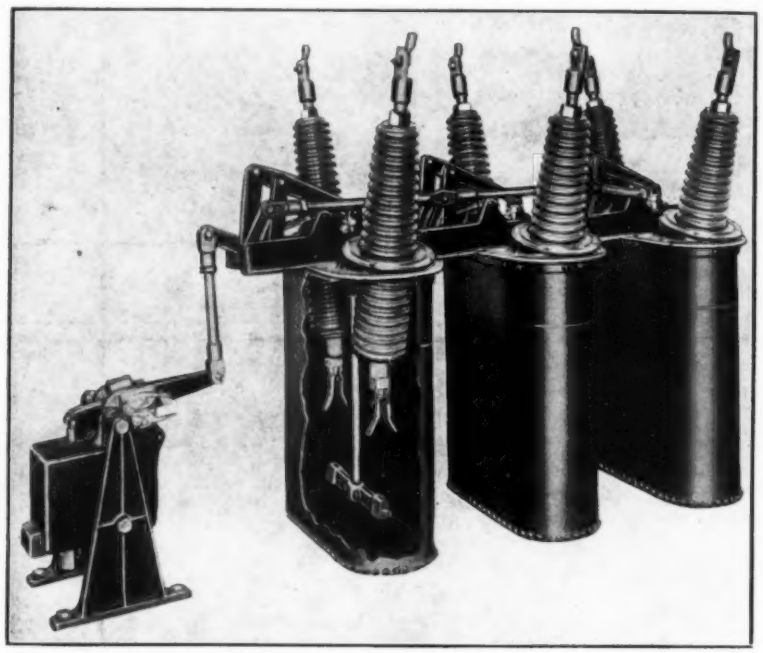
The device which is illustrated herewith is an improved portable telephone which answers these requirements. The complete outfit consists of a solid hardwood case with rainproof hinged lid fitted with double locks and containing a loud-speaking transmitter with interchangeable microphone, microphone switch, powerful three-bar magneto, induction coil, receiver, besides connecting plugs and accessories including fuses, also two dry cells for the microphone battery. Fitted under the box is a special earth connecting rod with steel end for boring into the earth. There is also used a special adjustable rod for tapping overhead telephone lines, whose fully extended length is 18 feet.

Adnil Telephone in Use.

All the current-conducting parts of the telephone apparatus and the rods are insulated from and inaccessible to the user, and all the internal metal parts which carry no current are connected to ground through the earth connecting rod. The internal parts of the telephone are mounted on a shelf which can be at once removed without disconnecting any wires. A flexible combined speaking and hearing tube is provided, and when not in use this and the magneto handles are carried inside the case in a place assigned thereto. The apparatus can be quickly packed up into a small space, and it is simple and reliable without being unduly heavy.

Self-Contained High-Voltage Oil Switches for Central Stations.

The accompaning illustration shows quite clearly practically all of the parts of an oil switch recently developed by the General Electric Company for use in central stations employing open wiring. This switch supersedes the well known type F, form K-10 placed on the market about three years ago, and which has made a particularly satisfactory record. The new switch, however, contains a number of improvements made possible by observation of the older switch in actual service. Among the most important of these are a rearrangement of the bushings which reduces the size of the oil tank necessary for any particular voltage and a change to a self-contained operating mechanism which makes the switches easier to install, and on the smaller units allows them to be shipped completely assembled. One feature of the K-10 switch, which helps to make its operation so satisfactory, has been retained. It is the sliding-wedge type of contract, which obviates burning of the working surfaces and keeps the contacts clean by a distinct rubbing movement when the switch is operated.



Solenoid-Operated, Triple-Pole, 3,500-Volt, 300-Ampere Oil Switch.

It can be seen from the illustration that in each phase there is used a single element with its self-contained mechanism, which is exactly similar to all other elements. The tank is made of boiler iron, lapped, riveted, reinforced and caulked, and of more than ample strength for the service. The switch can be operated by hand, by a direct-current solenoid or by an air diaphragm, and tripped automatically by the usual methods. The new switch described above is known as the type F, form K-21.

Necessary Office Ventilation at Small Expense.

According to the dictum of many physicians, every grown person needs 3,600 cubic feet of fresh air every hour. Without this amount of pure air, any man or woman labors under an unnecessary burden that lowers the vitality and reduces the efficiency for accurate work by an amount proportional to the decrease in the air supply.

Take the case of an office 14 by 20 feet and 11 feet high, which contains about 3,080 cubic feet of air. To supply each of four occupants with 3,600 cubic feet of fresh air per hour, the air must be completely renewed about six times per hour, or a little oftener than once every ten minutes. It is evident that it would take a pretty strong draft blowing through a 5-foot window raised three inches to secure this ventilation. In the winter, coat collars would be turned up,

fur collars put on, and there would be four pairs of cold feet. But ventilation can be secured without cooling the room.

If a small motor-driven blower is arranged with a few short pieces of pipe so that fresh air is drawn from the outside and delivered against a steam radiator, the air will be warmed and delivered in a gentle current which will not cause any one to be uncomfortable and yet the room will be warm and the air fresh.

Such an arrangement is shown in Fig. 1, in which a Westinghouse general-utility motor driving a Sirocco blower is mounted on a stand directly over a steam radiator. The intake of the blower is piped with a gate between it and the board set in the window to give access to the outside air; the outlet delivers the air at the top of the radiator. The air is prevented from blowing along the floor by a galvanized iron box which surrounds the radiator on all four sides, extending from the floor to the top of the radiator but open at the top. Thus the cold air is delivered at the top of the radiator in a downward current, and before it can find its way out of the box again, it must rise around the radiator and become warmed. The blower shown is capable of supplying 175 cubic feet of air per minute, or 10,500 cubic feet per hour, a sufficient supply for three persons. The natural ventilation provided through the opening of doors, around the edges of the windows, and in other ways is sufficient for an additional person.

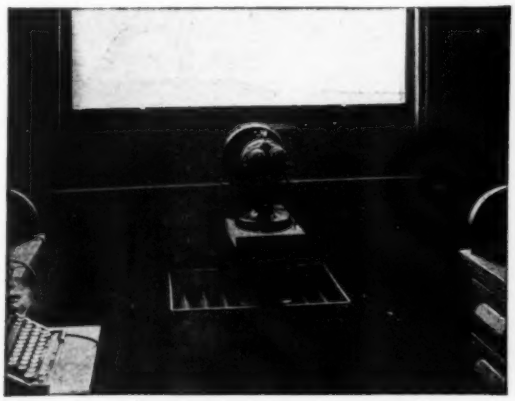


Fig. 1.—Blower Forcing Air Downward Through Radiator.

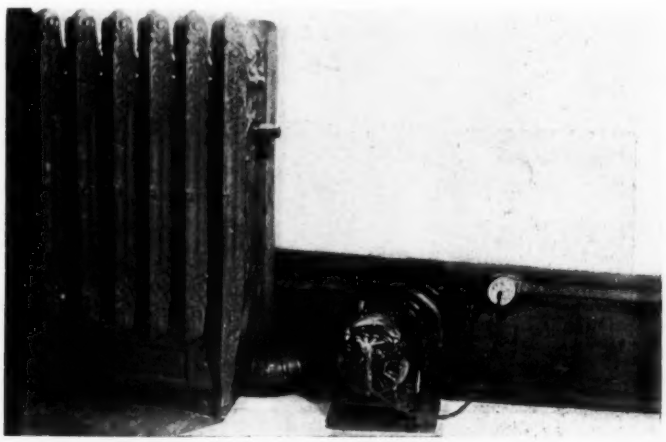


Fig. 2.—Blower Forcing Air Upward Through Radiator.

A slightly different application of this method of ventilation is to be seen in the Pennsylvania Station at Pittsburgh, Pa. When this building was originally planned, it was equipped with what was at that time considered a thoroughly adequate ventilating system. The waiting rooms were furnished with fresh air by large motor-driven fans, and the offices were served by a system of ducts which communicated with the outside air, the natural draft being depended on for circulation.

But as the offices became more crowded, and especially as the officials began to realize the importance of an ample supply of fresh air in rendering employees comfortable and efficient, it became evident that the natural draft was not sufficient and some other arrangement must be made.

The problem was solved economically and effectively by installing in each office needing it a small motor-driven ventilating set consisting of a Westinghouse motor and a Sirocco blower. As shown in Fig. 2, the blower set is placed on the floor near the radiator. It draws fresh air in through the existing ducts and forces it out through the radiator, thus filling the room with fresh warm air. Current is obtained from the lighting circuit. In some inside offices, the sets are used in summer as well as in winter.

This arrangement is ideal for ventilating buildings not equipped with modern ventilating plants. The set is quiet, takes up very little room, and needs no attention beyond lubrication every few months. A large volume of air is handled at quite a high pressure. The sets are furnished in several different sizes to suit various conditions.

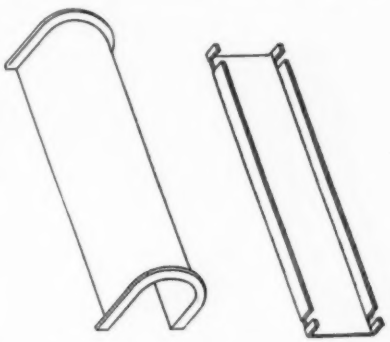
It should be remembered that the action of the blower will be to stimulate the action of the radiator; the cold air cools the radiator, condenses the steam and causes fresh steam to enter; thus increasing the circulation of steam and causing the radiator to give out more heat.

Steel-Reinforced Aluminum Cable.

There has been placed on the market a steel-reinforced aluminum cable consisting in all of seven strands. The six other strands are made of aluminum, and the inner strand is made of steel of high tensile strength. It is claimed for this conductor that it both transmits the current and has the requisite strength for use in the towers which are rapidly displacing poles in transmission lines. The Pacific Light & Power Company, of Los Angeles, Cal., has adopted this product for a 275-mile transmission line.

Separator for Use in Connecting Meter Groups.

In order to facilitate and at the same time to safeguard meter connection where several meters are grouped together in one building, the Metropolitan Engineering Company, 1240 Atlantic Avenue, Brooklyn, N. Y., has placed on the market a simple connecting device known as a Separator. As shown in the diagram herewith, this consists of two parts, a trough and a cover, which readily fit together and are installed without tools. The separator is used as a raceway for the service wires that run from one meter to the next. These are simply placed in the trough and the cover secured over this, its ends being held by the cover for the meter cutout and test block so that no tampering of the wires can be done. This also saves considerable time and labor in making the connections, as formerly it was necessary to first secure a piece of tubing or flexible duct and then thread each wire through this.



Separator for Meter Connections.

Portable Combination Alternating-Current and Direct-Current Indicating Instruments.

The Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., has just introduced a line of high-grade direct-reading instruments for general testing and laboratory work where especially high accuracy is desired, particularly on alternating current. The type PC voltmeters and wattmeters operate on the moving-coil principle. The perfectly damped character of the indications enables readings to be taken quickly and accurately, and makes these meters very desirable in measuring fluctuating loads.

The fundamental advantages of moving-coil meters are the high accuracy attainable and the fact that they can be used on either direct-current or alternating-current circuits.

The movement is mounted as a unit and can be removed complete after taking off the face-plate, which makes a dustproof joint with an inner aluminum mounting plate. The meters have a laminated-iron shield riveted to the aluminum mounting plate, protecting the movement both from dust and from stray magnetic fields. The weight of the moving element is in all cases low, thus preserving the pivot jewels from wear, and the torque is relatively high. The pointer is of U section, to secure great strength with minimum weight. The moving element is not light enough to be delicate, yet not heavy enough to injure the jewels during shipment, or to produce wear in use. The weight of the moving element is less than five grams.

The meters attain their highest accuracy on alternating current, and are free from temperature, frequency and wave-shape errors. On direct current, the meter may be subject to slight errors due to residual magnetism of the laminated-iron shield, but this can be entirely eliminated by taking the average of reversed readings.

A contact switch operated by a button on the front of the instrument is provided on each voltmeter. The voltmeters are entirely self-contained, all necessary resistors to obtain the calibrated scale readings being contained in the case, which is well ventilated.

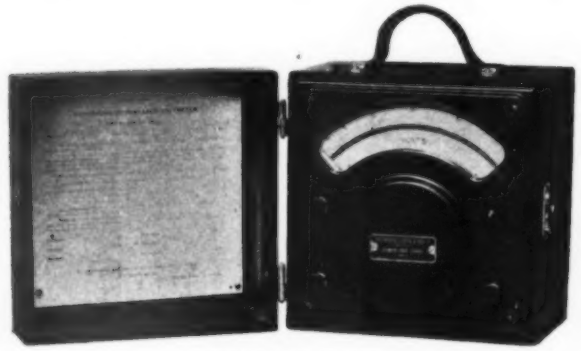
The wattmeters are also entirely self-contained, all resistors necessary for the rated voltage being contained in the case. The wattmeters that have double current or double voltage range are provided with a switch operated by a knob on the face-plate, which makes the proper series or series-parallel connection of coils when the knob is turned to the proper position. Only two current and two voltage binding posts are, therefore, necessary.

The meters are mounted in hardwood carrying cases 7.75 by 7.75 by 6.3125 inches. They have hinged covers that are easily removable, and flexible sole-leather handles.

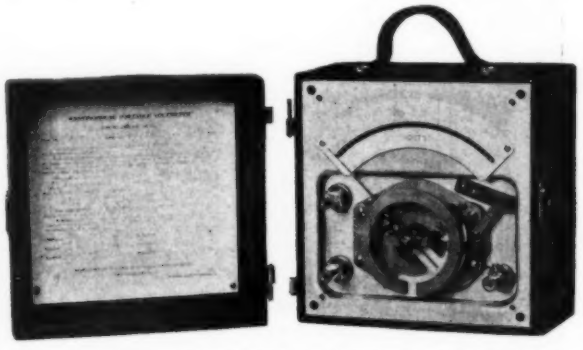
By means of a special damping sector moving in the concentrated field of a permanent magnet, unexcelled damping features are obtained, which eliminates unnecessary wear on bearings, and mechanical shocks.

The scale covers an arc of 90 degrees, giving large, open divisions. The scale for the wattmeters is wider at the lower end to give high accuracy for the low readings, and for the voltmeters wider at the middle, where readings are most frequently made. A mirror extending the entire length of the scale prevents parallax in reading.

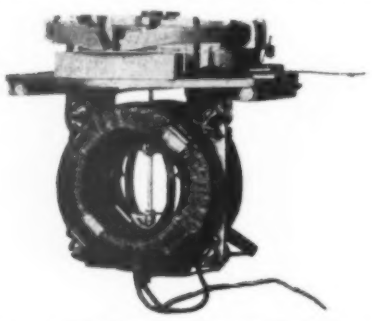
The terminals are finished in bright nickel. The face-plate is of polished black composition, and the case is polished walnut.



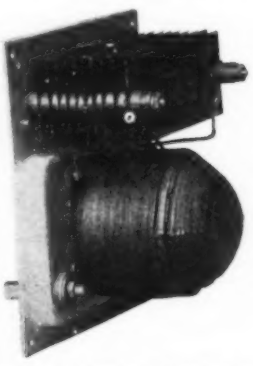
Portable Voltmeter.



Damping Mechanism Exposed by Removal of Face-Plate.



Bottom View, Showing Electrodynamometer Coils.



Back View, Showing Resistance and Iron Shield.

Delta-Star Portable Phase-Rotation Indicator.

Portable Phase-Rotation Indicator.

When installing polyphase motors, generators, meters, etc., it is frequently found that the direction of the rotation is reversed, due to crossing of windings or leads, thus causing incorrect phase rotation. This is especially true when motors or meters are connected by the construction men, who frequently find it necessary to reverse leads, cables, etc., all of which entails loss of time and additional expense.

Changes in shop or distribution circuits causing accidental reversal of

phase may cause serious damage, as has actually happened in shops and elevators, especially if the men installing the equipment did not check out the phase rotation. Checking out phase rotation is somewhat difficult for the ordinary man to understand, as it involves the use of complicated connections, phasing lamps, etc. When it is absolutely necessary to have motors start in the correct direction, such as on presses, elevators, and on some shop tools, it is essential that the phase rotation be positively determined.

The type S portable phase-rotation indicator illustrated herewith positively indicates on the dial the phase rotation of polyphase circuits and, as its connection to the circuit requires no more experience than is necessary to connect up a voltmeter, the ordinary installer finds it very useful in his work. A deflection of the pointer to the right or left positively indicates the phase rotation and enables the correct initial installation of equipment. This new indicating instrument is manufactured by the Delta-Star Electric Company, Chicago, Ill., which has adopted this design after an experience extending over several years.

Micarta.

A remarkable new insulating material to take the place of hard fiber, glass, porcelain, hard rubber, built-up mica, pressboard, rawhide, molded compounds, etc., has been developed by the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa. It is known as Micarta.

It is used for commutator bushings and brush-holder insulation, as noiseless gear blanks, as conduit for automobile wiring, as spools for spark-coil and magnet windings, for refillable-fuse tubes, for wireless-coil separators, for arc shields in circuit-breakers, for water-meter disks, etc.

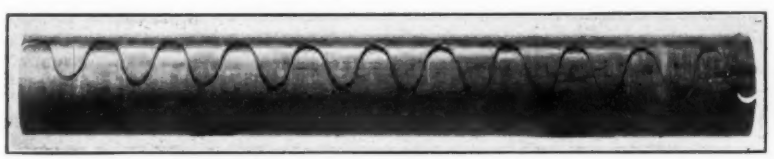


Fig. 1.—Harmonic Fracture in Micarta Tube After Severe Compression.

Micarta is a tan-brown colored, hard, homogeneous material having a mechanical strength about 50 per cent greater than hard fiber. It can readily be sawed, milled, turned, tapped, threaded, etc., if a sharply pointed tool is used and the work done on a lathe. It can be punched only in thin sheets and cannot be molded. Micarta is not brittle and will not warp, expand, or shrink with age or exposure to the weather, but takes a high polish presenting a finished appearance.

Two grades of the material are made. The grade known as Bakelite Micarta will stand a temperature of 150 degrees centigrade (302 degrees Fahrenheit) continuously, or 260 degrees centigrade (500 degrees Fahrenheit) for a short time. It is infusible and will remain unaffected by heat until a temperature sufficient to carbonize it is reached. Heat will not warp Bakelite Micarta, and it will stand an electric arc better than hard fiber, hard rubber, built-up mica, or any molded insulation containing fibrous or resinous materials. Its coefficient of expansion is low, being approximately 0.00002 per degree centigrade.

Bakelite Micarta is insoluble in practically all of the ordinary solvents such as alcohol, benzine, turpentine, and weak solutions of acids and alkalis, hot water and oils. It is indifferent to ozone—an advantage over hard rubber, resins, etc., for electrical purposes. It is non-hygroscopic and impervious to moisture.

The other grade, designated as No. 53 Micarta, has the same mechanical and electrical properties as the Bakelite Micarta but differs in its chemical and thermal properties. The plain Micarta behaves toward chemicals and heat very much as an ordinary resin. This grade is not used in plate form.

As proof of the uniformity of structure of Bakelite Micarta, the illustration of a fracture is shown in Fig. 1. This is not a saw cut, but a natural break. The tube was held tight on a metal mandrel and a compressive force was applied at one end of the tube. When the force became sufficiently great the tube split as shown. The uniformity of the wavy fracture shows how homogeneous the material is. Such a break is known as a "harmonic fracture." The strains in a homogeneous material under stress follow a sine-wave law.

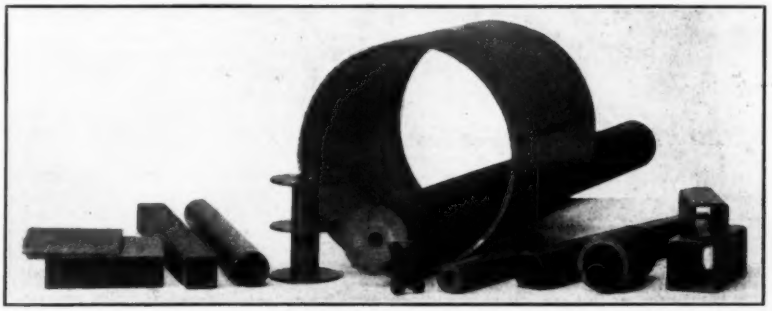
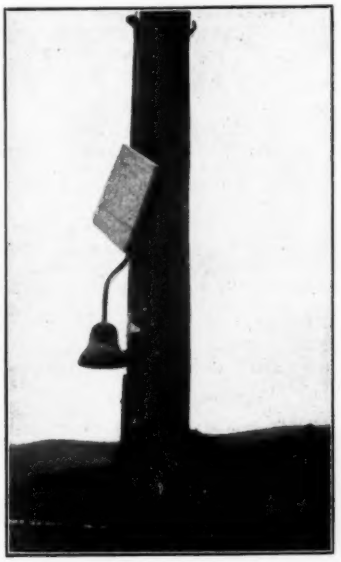


Fig. 2.—Samples of the Variety of Uses for Micarta.

Roadside Telephones.

Throughout Southern California a series of emergency telephones have been erected along the many hundred of miles of improved roads as well as along the state highway running from San Diego to San Francisco. There telephones were erected by a Southern California emergency association and are intended for the use of the members of that organization only.

Inside of the iron bell the receiver and transmitter are located, and when in trouble the autoist simply walks along the road to the nearest emergency station, inserts an especially provided key in the lock at the under side of the bell, turns the key and the telephone apparatus drops out. On the signboard just above the iron bell the party in trouble is informed as to his whereabouts and the number of the nearest garage is given. In addition to these instructions there is information of interest to all.



Roadside Telephone in California.

Latest Approved Fittings

The electrical fittings illustrated and described in this department have been approved by the Underwriters' Laboratories, Incorporated, following examination and tests conducted under standards of the National Electrical Code as recommended by the National Fire Protection Association.

CABINETS.—Portland Railway, Light and Power Company, Portland, Ore.

Approved May 23, 1913.

CABINETS.—Standard Mechanical Equipment Company, 1919 Elm Street, Dallas, Tex.

Approved May 23, 1913.

CONDUIT, Rigid.—National Enameling & Manufacturing Company, Youngstown, O.

"Armyduct"; galvanized exterior and black enameled interior.

Approved May 13, 1913.

FIXTURE STUDS.—National Metal Molding Company, Fulton Building, Pittsburgh, Pa.

"National" stamped steel hollow center fixture studs. Catalog Nos. 2250-2253, inclusive.

Approved May 23, 1913.

INCUBATORS AND BROODERS, Electrically Heated.—V. Weber & Company, 8 Johnson Street, Newark, N. J.

"Freas'" Electric Incubators, 75 watts, 110-240 volts, Catalog Nos. 20, 24, 28, 32, 36 and 40. For bacteriological and other scientific purposes. Each of these devices consists of a chamber having a wire-wound heating element regulated by a thermostat. For use on ordinary lighting circuits.

Approved May 23, 1913.

LAMP LOCK.—Rotating Electric Lamp Lock Company, 1525 North Rockwell Street, Chicago, Ill.

Rotating Electric Lamp Lock, 660 watts, 250 volts.

A socket extension provided with collar at the attachment-plug end for locking to the shade ring of the socket and with a rotating shell in which a lamp may be locked.

Approved May 26, 1913.

LINTER MAGNET.—Atlanta Utility Works, East Point, Ga.

This device consists of a series of magnet coils with a pair of pole pieces in the form of long steel bars. It is used to attract and retain particles of iron or steel that may be present in cotton seed passing to the linters.

Approved May 23, 1913.

PANELBOARDS.—California Electric Supply Company, 643 Mission Street, San Francisco, Cal.

Approved May 23, 1913.

PICTURE MACHINES AND APPLIANCES.—W. L. Hazen, 6347 Jackson Avenue, Chicago, Ill.

"Hazen" Rewind. A sheet-metal box designed to inclose films during the process of rewinding. The box is provided with a spindle driven by a chain from a sprocket on the crankshaft, roller valves being provided in the sides through which the films may be run for inspection during the rewinding process.

Approved May 28, 1913.

RECEPTACLES, for Attachment Plugs.—Central Electric Company, 320 South Fifth Avenue, Chicago, Ill.

Receptacles for attachment plugs and plugs.

Catalog No. 1, 25 amperes, 220 volts; fuseless.

Catalog No. 2, 30 amperes, 220 volts; fusible.

Catalog No. 3, 60 amperes, 220 volts; fusible.

Catalog No. 4, three-phase, fuseless; 15 amperes, 440 volts; 30 amperes, 220 volts.

Catalog No. 8, 30 amperes, 220 volts; fuseless.

Approved May 23, 1913.

RHEOSTATS.—Independent Electric Manufacturing Company, Milwaukee, Wis.

Alternating-current drum controllers for slip-ring motors, 110 to 660 volts.

Bulletin 2505, drum-type starters.

Bulletin 2510, drum-type regulators, continuous duty without primary switch.

Bulletin 2520, drum-type controllers, reversible, intermittent duty for hoists.

Bulletin 2525, drum-type speed regulators, reversible, continuous duty.

Approved May 28, 1913.

RHEOSTATS.—The Cutler-Hammer Manufacturing Company, Milwaukee, Wis.

Battery charging; Bulletin Nos. 8540, 8560, 8570; protective devices for same, Bulletin No. 8550.

Push-button stations, Bulletin No. 8645, for use with automatic controllers.

Approved May 29, 1913.

SOCKETS, Standard. — Benjamin Electric Manufacturing Company, 128 South Sangamon Street, Chicago, Ill.

"Benjamin," 660 watts, 250 volts.

Keyless double-ended sockets, porcelain lined. Catalog Nos. 455-457 inclusive.

Approved April 29, 1913.

SOCKETS, Standard.—Peru Electric Company, Peru, Ind., for Any Lite Incandescent Lamp Regulator Company, North Yakima, Wash.

"The Electric Lamp Wick."

A combination of a keyless brass-shell socket and Edison-type attachment plug with a resistance wire and regulating switch connected in series.

Approved May 22, 1913.

SWITCHES, Knife.—Carman & Fryer, 416-418 East Market Street, Indianapolis, Ind.

"Star-Delta" motor-starting switches, 60, 100, 200 amperes, 250 volts, knife-blade switch of special design to be used for starting alternating-current motors having windings adapted to "delta-star" connections.

Approved May 24, 1913.

SWITCHES, Combination Cutout.—Palmer Electric and Manufacturing Company, 161 Franklin Street, Boston.

Service switch and fuse box, 30 amperes, 125 volts; Catalog No. 306.

A special two-pole knife switch with plug fuse cutouts mounted on the inside of the hinged cover of an iron cabinet. A sealable compartment is provided for the terminals of the supply wires.

Approved May 22, 1913.

SWITCHES, Push-Button Flush.—Union Electric Company, Hamilton Avenue and Clark Street, Trenton, N. J.

Approved June 3, 1913.

SWITCH BOXES.—Allino Switch Box Manufacturing Company, 1015 Pine Street, St. Louis, Mo.

"Allino." Pressed-steel switchbox for use with flexible tubing.

Approved May 22, 1913.

SWITCH BOXES.—Machen & Mayer Electrical Manufacturing Company, Twenty-first Street and Fairmount Avenue, Philadelphia, Pa.

Type L, Catalog Nos. 7001-7004, inclusive.

Type S, Catalog Nos. 7051-7054, inclusive.

Approved May 28, 1913.

THEATER APPLIANCES.—Stanley & Patterson, 23 Murray Street, New York, N. Y.

Stage Receptacle, Catalog No. 1505; 50 amperes, 250 volts.

Approved May 14, 1913.

THEATER APPLIANCES.—Russell & Stoll Company, 48 Cliff Street, New York, N. Y.

"R. & S. Co."

Catalog No. 13; stage pocket and plug, 50 amperes, 125 volts. Receptacle with porcelain base mounted in suitable cast-iron floor box. Plug of red fiber provided with fiber clamp replacing knot in cord.

Approved May 14, 1913.

Current Electrical News

LIGHTING AND POWER.

(Special Correspondence.)

ELY, MINN.—A three-mile "White Way" will be erected. C.

WASHINGTON, IOWA.—By November 1 the city will have a $11,000 electric lighting system. C.

MANLY, IOWA.—F. J. Hanlon has been granted a franchise to establish an electric light plant here.

BELLEVUE, IOWA.—The City Council voted $600 to put in boulevard lights consisting of 37 electroliers. C.

ITASCO, TEX.—The Texas Light & Power Company will expend about $12,000 improving the electric plant.

ORANGE, CAL.—The Pacific Light & Power Corporation has been granted a 50-year franchise in this city.

AMHERST, VA.—$10,000 will be expended for the erection of an electric light plant here. Address the town clerk.

PIEDMONT, W. VA.—The Piedmont Electric Light & Power Company will improve its electric light plant.

KALAMAZOO, MICH.—The Coddington Engineering Company will erect a municipal power plant here, at a cost of $29,100.

MONMOUTH, ILL.—It is reported that the Monmouth Commercial Club has secured enough funds to install an ornamental lighting system. Z.

WHITESBORO, TEX.—The city will erect an electric light plant to develop 60 horsepower. W. S. Buster, mayor, is in charge of the matter.

LAKELAND, FLA.—The city is considering a $100,000 bond issue to enlarge the electric light plant here. Address city clerk in regard thereto.

ARANSAS PASS, TEX.—The City Council has granted a franchise to C. J. Stanzel of Aransas Machine & Boiler Works to build light and power plant.

DES MOINES, IOWA.—The Des Moines Electric Company is considering the extension of the "White Way." W. H. Thompson is manager of the company. C.

CADIZ, KY.—A. P. White & Company, flour millers, will install an electric light equipment in connection with the new mill they have just completed in this city. G.

ROCHESTER, MINN.—The Utility Board will soon advertise for bids for material to add 60 ornamental lights to the street lighting system, to cost about $8,000. C.

MILWAUKEE, WIS.—A new system of street lighting with lower lights of an artistic design are being urged by J. P. Keenan, of the Citizens' Business League. Z.

CHATTANOOGA, TENN.—The Chattanooga & Tennessee Power Company will erect a plant here to develop 25,000 horsepower. W. E. Boileau is general manager.

PENIEL, TEX.—Mayor W. G. Airhart has made arrangements with the municipal electric light and power plant at Greenville, Tex., to supply Peniel with light and power. Z.

BRYAN, O.—This city is preparing to construct an ornamental street lighting system and will shortly ask for bids. John A. Neill, clerk, may be addressed in regard to the matter.

LA CROSSE, WIS.—A lighting and power plant will be built for the high school and Hixon annex. William Luenning, president of the Board of Education, is reported to be in charge of the matter. C.

PAXTON, MASS.—W. D. Thompson, electrical engineer, Leicester, is co-operating with a special committee from Paxton regarding a municipal electric lighting plant to be established here.

FONTANELLE, IOWA.—The Council has closed a contract with Professor J. B. Hill of Iowa City to draw plans for and oversee the construction of the electric light system here.

OAKES, N. D.—Oakes Light & Power Company has been incorporated with a capital stock of $50,000 by F. A. Blakeslee, A. P. White, of Bemidji, Minn., and C. F. Blakeslee, of Oakes.

ALBANY, MO.—The city will expend about $19,000 for improvements to be made to the electric light plant here, to develop 200 horsepower. Address W. E. Nonnan, superintendent, for information.

EDDYVILLE, KY.—The city has purchased an electric light plant, heretofore operated by the state in connection with the penitentiary at Eddyville, and will enlarge it and install a street lighting system. G.

VANCOUVER, B. C.—The Bridge River Company will develop electricity from water power to the extent of 200,000 horsepower in Lillooet district. Improvements for the same, requiring dam and tunnel, will cost about $8,000,000. C.

HOWARD, KANS.—The voters of this place have decided by a large majority that a municipal electric lighting plant will be established here. Work on the new plant will be started just as soon as the bonds for it are sold.

SAN BENITO, TEX.—The S. A. Robertson Company has been granted a franchise by the City Council for the construction of an electric light and power plant, and a telephone system here. S. A. Robertson is president of the company. D.

MAXWELL, IOWA.—C. E. Lookingbill and W. C. Enfield have been negotiating with the Iowa Railway & Light Company for a transmission line to be run from Nevada to Maxwell. Here a company will be formed to sell light and power. Z.

OSKALOOSA, IOWA.—The Oskaloosa Traction & Light Company will extend the power line from New Sharon to Montezuma, a distance of 12 miles. The McKinley people, who now own the Oskaloosa Company, expect to spend $40,000 on this work. C.

OAKLAND, CAL.—George E. Babcock, city electrician, is preparing a report on a proposition to install a municipal system of street lighting. The plan provides that the city installs the system, district by district until the municipal lines extend over the entire city.

COQUILLE, ORE.—The H. M. Byllesby Company, owner of the Oregon Power Company, is negotiating for the purchase of the electric light plant here. If the deal goes through much work of improvement will be done. Elmer E. Doyle, of Tacoma, is vice-president of the company.

SAN FRANCISCO, CAL.—The San Joaquin Light & Power Company has applied for authority to issue $2,500,000 in bonds, and to use them as collateral security for the issuance of $1,875,000 of two-year collateral-trust notes. The proceeds are to be used for additions to the Company's facilities.

BELLINGHAM, WASH.—The City Council is in favor of a municipal light and power plant to be established on the Nooksack River. President Raymond, Chairman Wyman, City Engineer North and City Attorney North have been instructed to investigate the project and make a report to the Council. O.

LOS ANGELES, CAL.—Petitions for an extension of the ornamental lighting system of Moneta Avenue, have been found sufficient and the Council has instructed that the ordinance of intention be prepared, after which bids will be called for. The proposed system will be a mile in length. T.

TUCSON, ARIZ.—The Tucson Gas, Electric Light & Power Company and the Tucson Rapid Transit Company, which are subsidiaries of the Federal Light & Traction Company, of New York, contemplates making extensions and improvements to its properties here at a total cost of about $150.000. D.

NILES, MICH.—It has been announced that J. F. Altermath, proprietor of the Brandywine Farm, is putting in a concrete dam with a view to generating electric power to light his house and grounds, and also furnish power for the operation of a pumping station and other farm machinery.

MARSHALL LAKE, WIS.—W. H. Wright, Spokane, Wash., is president of the Marshall Lake Power & Land

Company, which has been incorporated for $60,000. It is the purpose of the company to develop electrical power. Associated with Mr. Wright in this undertaking is N. E. Linsley and Lewis Parkhurst.

LOS ANGELES, CAL. — Harbor Engineer Judd has presented plans and specifications for the electric installation of Shed No. 1, on Pier A, island channel wharf, to the City Council and these were adopted. Bids for this work are to be asked for as soon as the plans are approved by the Harbor and Public Works Commissions. T.

MANKATO, MINN. — A special meeting of the City Council will be held on July 14 to consider the renewal of the city's lighting contract with the Consumers' Power Co., or any other person or company who furnish the city with power and light at a fixed rate. The expediency of erecting a municipal lighting plant will be investigated. C.

FOSTER, ORE.—F. B. Knapp, manager of the Hotel Foster, here, purposes constructing an electric lighting plant. It is understood a 40-kilowatt, 600-revolutions-per-minute machine, generating 2,200-volt three-phase current and a 3-kilowatt, 125-volt exciter, together with a large switchboard, etc., will be installed. O.

DENISON, TEX. — The Texas Power & Light Company has adopted plans for its proposed hydroelectric plant that it will erect on Red River, three miles north of Denison, at a cost of about $1,000,000. It will construct a system of transmission lines and supply electric power and lights to a number of towns in this part of Texas and in Oklahoma. D.

LOS ANGELES, CAL.—Rights of way have been secured by the Pacific Light & Power Company for the extension of power lines into Ingledale Knolls from this city. Lines for energy for street lighting on Burleigh Avenue will be erected in a few weeks, and the extension of electricity to Ingledale Acres, just north of Ingledale Knolls, will be effected in the fall. T.

SAN ANTONIO, TEX.—The San Antonio Gas & Electric Company has increased its capital stock for the purpose of providing for improvements to its properties. The San Antonio Traction Company, an affiliated concern, has also increased its capital stock for the same purpose. W. B. Tuttle is vice-president and general manager of both companies. D.

GLENAVON, CAL.—The Southern Sierras Power Company has accepted the contract for the furnishing of electric power to the residents of this city for street, domestic and power purposes. The company is now doing the preliminary work on the construction of the transformer house and bungalow. Contracts for the necessary machinery for the power establishment will be let within a short time. T.

HOUSTON, TEX.—The Texas Public Service Company which has just been organized with a capital stock of $500,000 will construct electric light and power plants, gas plants and waterworks systems in a number of towns in Matagorda, Upshur, Titus and Wilbarger Counties, according to the provisions of its charter. The incorporators are Albert Emanuel of Dayton, O.; H. A. Van Eaton, Raymond Neilson, C. H. Wilson, R. C. Patterson and W. A. Parish, all of Houston. D.

IMPERIAL, CAL. — The City Council of this city, at the suggestion of the Imperial Chamber of Commerce, has started a movement which will ultimately result in the establishing at this place of a municipal electric light and power plant. I. B. Funk, of Imperial, has been directed to obtain figures on the cost of installing the proposed electric lighting plant, and City Attorney H. N. Dyke has been directed to ascertain the limit to which the city can bond itself for this purpose. T.

PHOENIX, ARIZ.—The Board of Control of the Industrial School, located in Phoenix, has under consideration utilizing the water power of Bonita Creek, which runs close to the Fort Grant reservation, for the purpose of supplying electric light and power which is needed for the school. The engineering corps which investigates the power possibilities of Bonita Creek will also make a survey for an electric road from Wilcox to Fort Grant. It is understood that Assistant State Engineer John S. Barlow will be assigned to the job.

LOS ANGELES, CAL.—City Attorney Schenk has presented to the City Council draft of an ordinance creating a conduit district, on certain parts of Eighth Street, prohibiting the erection of maintenance of wires and poles carrying wires for the transmission of electric current within said district. It provides that such conduit shall be laid underground within 40 days from the date the ordinance becomes effective and that the wires be placed underground within 12 months, with the exception of trolley wires and wires used for street lighting. T.

TELEPHONE AND TELEGRAPH.

(Special Correspondence.)

FARGO, N. D.—The North American Telegraph Company will establish an office here. C.

PLAINVIEW, TEX.—The Southwestern Telephone Company will install a new system here to cost about $40,000. Z.

ALBANY, N. Y.—Secretary Isadore Wachsman has been directed to advertise for bids for placing the fire-alarm wires underground.

LEWISTON, IDAHO.—Articles of incorporation for the Crescent Southwick Co-Operative Telephone Company have been filed. C.

GRAND FORKS, N. D.—The North American Telegraph Company will open an office here soon. John Bartness will be the manager. C.

LEWISTON, IDAHO.—The Crescent-Southwick Co-operative Telephone Company has filed articles of incorporation with the County Recorder.

SAN BENITO, TEX.—The City Council has granted a 50-year franchise to the S. A. Robertson Company to operate telephone, water, light and power systems. Z.

SHEBOYGAN, WIS.—W. J. Gallon, manager for the Citizens Telephone Company, states that $27,000 worth of improvements will be completed by August 31. C.

FRANKFORT, KY.—The Summerville Telephone Company has been incorporated with a capital stock of $600 by R. L. Morris, J. B. Estes, Dave Milby and Jake Milby.

BAGDAD, VA.—The Campbell-Terrell Telephone Company has been incorporated with a capital stock of $5,000, J. B. Campbell, president, and J. P. Campbell, secretary.

FRANKFORT, KY.—The Mount Zion Telephone Company has been incorporated with a capital stock of $300 by John Christie, Sam White, MacBaldwin and Joe Hughes.

GILMORE CITY, IOWA.—G. E. Ross, general manager of the Northern Telephone Company, states that extensive improvements will be made to the Company's property here. C.

LINDSAY, CAL. — The Lindsay Home Telephone & Telegraph Company has applied for permission to issue 1,644 shares of capital stock for the purpose of extending its system.

RIVERSIDE, WASH.—The Farmers Telephone Company was recently organized here, capitalized at $10,000. Construction work will be ordered. A. W. Campbell, this city, is president, and C. E. Blackwell, secretary-treasurer. O.

EATONVILLE, WASH. — J. H. Kipper, representing ranchers at Silver Lake has asked the Commercial club for financial aid to erect a rural telephone line. George R. Overmeyer was elected secretary of the telephone company. C.

VANCOUVER, B. C.—The Provincial Government contemplates constructing a telephone line from Heriot Bay across Valdez Island to the mainland, 60 miles distant, connecting with the Dominion Government at Heriot Bay, and terminating at Loughbury Inlet. O.

SOUTH PASADENA, CAL.—Upon being granted a franchise to run for 40 years by the council of this city, the Home Telephone Company, which operates here, has made the assertion that it will greatly enlarge and improve its service, this to apply to every part of the system. T.

OKLAHOMA CITY, OKLA.—An Oklahoma charter has been granted to the Adell Rural Telephone Company, of Adell, with $500 capital stock. The incorporators are W. H. Haney, J. F. Gilbert, George Lee and Grant Flynn, of Wantee; Frank McCall and J. R. Williams, of Trpisdale. P.

GREAT FALLS, MONT.—The Bell Telephone Company recently sold the Great Falls Telephone Company to Thaddeus S. Lane, of Spokane, Wash., president of six independent automatic telephone companies of Montana and Washington. It is reported that much improvement work will be done. O.

MENLO, WASH.—The Willapa Valley Telephone Company has been organized by farmers of the Willapa Valley and will be operated in conjunction with the Willapa Harbor Telephone Company, of Raymond, Wash. A new line will be constructed at an estimated cost of $4,000.

ROSEBURG, ORE.—Articles of incorporation have been filed by the Cleveland & Coles Valley Telephone Company. The incorporators are A. F. Clayton, W. R. Vinson, and John Krone. A rural telephone line will be constructed from Roseburg to Melrose, Cleveland, Coles Valley, and Garden Valley. The principal office of the Company will be at Cleveland. O.

ELECTRIC RAILWAYS.

(Special Correspondence.)

CARONA, CAL.—The Pacific Electric Railway has been granted a franchise in this city.

NASHVILLE, TENN.—The Nashville Railway & Light Company is considering plans for the extension of its line from Nashville to Rock City. Address H. A. Davis for particulars.

OMAHA, NEB.—The Omaha, Sioux City & Niobrara Railway Company has been incorporated for $100,000. This company will be operated by the Sioux City, Omaha & Niobrara Power Company.

HERSHEY, PA.—M. S. Hershey has suggested a trolley line to people living between Hershey and Elizabethtown, and if the feeling is mutual Mr. Hershey will undertake to build the road.

AUGUSTA, GA.—The City Council has granted a franchise to the Augusta Aiken Railway & Light Company to construct and operate an electric railroad on Craig Street. E. C. Deal, of Augusta, is general manager.

GREENVILLE, TENN. — Representatives of a Canadian syndicate are reported to be soliciting capital for a 42-mile electric railway from Greenville to Kingsport. It is expected that the road will require an outlay of $1,000,000.

MINNEAPOLIS, MINN.—The Minneapolis Street Railway Company has accepted the order of the City Council to construct in 1914, eight street railway extensions. The Council agrees not to ask for other street railway extensions before January 1, 1915. Z.

FRESNO, CAL.—The Fresno Traction Company announces that construction on the road from Muscatel to Biola will start about July 15. The road was originally promoted by J. B. Rogers and associates and rights of way are being turned over to the traction company.

JEFFERSON, TEX.—The Texas-Louisiana Traction Company has been granted a franchise by the City Council for the use of certain streets of this city by its proposed interurban electric line that is to run between Longview, Tex., and Shreveport, La. Captain A. B. Blevins is president of the company.

VANCOUVER, B. C.—The Canadian Pacific Railway Company proposes to electrify its branch line between Castlegar and Rossland. Engineers are at the present time preparing plans for the proposed improvement. F. W. Peters, general superintendent, this city, is given as authority for the statement. O.

BILLINGS, MONT.—H. Lee Mains and others, of the Highland Holmes Company, are promoting the proposition of building a street car line from this city to the Polytechnic Institute, during the summer. Work of running surveys for this line is now under way and actual construction will be ordered shortly. O.

LANSING, MICH.—The Muskegon-Ludington-Manistee Railway Company, capitalized at $1,500,000, which has filed articles of incorporation, will build an electric line connecting the three points named. The state Railway Commission has given its permission to issue $1,500,000 in bonds and $1,500,000 in stock. The campaign for a bonus of $280,000 is now practically completed and work on the proposed Muskegon-to-Manistee lake shore interurban route may be started this fall.

KNOXVILLE, TENN.—The Maryville-Knoxville Interurban Railway Company has been incorporated with $10,000 capital stock for the purpose of building an electric traction line from Knoxville to Maryville, a distance of 14 miles. The incorporators include R. M. McConnell, T. G. McConnell, H. Kornick and others. G.

SEATTLE, WASH.—The City of Seattle has agreed to accept as a gift the Highland Park & Lake Burien street railway line, which was offered recently by the Puget Sound Traction, Light & Power Company. The line extends a distance of 9 miles and represents an investment of $125,000. The City will expend $12,000 putting the line in shape for operation. O.

LOS ANGELES, CAL.—Paul Shoup, president of the Pacific Electric Railway Company, has announced that the company intends, as soon as possible, to begin work on a short line between this city and Santa Monica. The cost of the construction will be $175,000, while the equipment will cost about $250,000 additional. The new line will be slightly under nine miles long. T.

BRAINERD, MINN.—The Minnesota Central Railway Company has been incorporated with a capital of $250,000. Joseph Ferrier, of Duluth; William F. Henry and John H. Hille, of Ironton are the incorporators. The plans are to construct a street railway in this city, lines in Central Minnesota and a high-power electric line to connect with Ironton, and other towns on the north Cayuna Range,

OMAHA, NEB.—An interurban railroad from Omaha to Niobrara, via Sioux City, Ia., with a network of branches covering Eastern Nebraska, some 440 miles, is the ultimate plan of the Sioux City, Omaha & Niobrara Power Company, which has filed articles of incorporation capitalized at $100,000. The road will cost about $18,000,000. Electricity to operate it will be furnished by water power. The incorporators are C. W. Baker, Herman Beuhman, Henry Rue, Frank Gelston, Chauncey Snyder, Peter Mangold and S. G. Peticolas.

FREEPORT, TEX.—Following the announcement from Austin that the Attorney General had approved the charter of the Gulf, Freeport & Northern Railway Company, with its principal offices to be located at Freeport, it is learned from one of the principal incorporators that the proposed line is to be an electric interurban road. This company proposes to build 100 miles of track from Freeport to Sealy. The principal power house of the road will be located here. From Freeport the new line will run to Brazoria, thence to West Columbia, and then on northward to Sealy, touching a number of small towns and cities.

PROPOSALS.

ELECTRIC RAILWAY.—Tenders are invited until August 9 for constructing an electric line from Balza to Linares, Province of Jaen, estimated to cost $76,280. Further particulars may be had from the Bureau of Foreign and Domestic Commerce at Washington.

ELECTRICAL WORK.—Sealed proposals will be received by John Tulloch, Liry Building, Sherman, Tex., until July 19 for the electrical work in the new hospital and power house.

MOTOR-DRIVEN EXTENSION PLANER.—Sealed proposals will be received by the Isthmian Canal Commission, Washington, D. C., until July 23 for a motor-driven extension planer, as per Canal Circular 784.

ELECTRICAL WORK.—Sealed proposals will be received by John J. Richards, Secretary of the Commission, Industrial Trust Building, Providence, R. I., until July 21 for the electrical work for the Armory of the Mounted Commands, R. I. N. G. A certified check for two per cent of the amount of proposal must accompany each bid.

ELECTRIC HOISTING MACHINE.—Maior H. M. Chittenden, chairman, The Port Commission, Central Building, Seattle, Wash., will receive bids until July 23 for an electric hoisting machine, with electric motor, controlling appliances, wire rope, electric wiring and conduit in connection with the Salmon Bay improvement being made here.

ELECTRICAL APPARATUS.—Sealed proposals will be received by the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until July 22 for furnishing 30 sets of telephone head gear; 7,000 feet of cotton-covered, rubber-insulated wire for ignition circuits; 100,000 feet of aerial wire, all for delivery at the Navy Yard, Brooklyn, N. Y., as per Schedule 5,617.

ELECTRIC CONDUIT AND WIRING AND INTERIOR LIGHTING FIXTURES.—Sealed proposals will be received at the office of the Supervising Architect, Washington, D. C., until August 4, for the electric conduit and wiring and interior lighting fixtures of a three-story building for the post office at Chickasha, Okla., and of a two-story building for the post office at Xenia, O.; and until August 5 of a two-story building for the post office at Sisterville, W. Va., in accordance with drawings and specifications, copies of which may be obtained from the custodians of the sites or from the office of the Supervising Architect.

ELECTRICAL CONDUIT AND WIRING AND INTERIOR LIGHTING FIXTURES.—Sealed proposals will be received at the office of the Supervising Architect, Washington, D. C., until August 4 for furnishing the electrical conduit and wiring and interior lighting fixtures for the post office at Greenwood, Miss.; until August 11 of a one-story building for the post office at Frankfort, Ind.; until August 12 of a one-story building for the post office at Cortland, N. Y.; until August 13 of a one-story building for the post office at Wahpeton, N. D.; until August 14 of a two-story building for the post office at Fulton, N. Y.; until August 15 of a three-story building for the post office at New Haven, Conn., and of a three-story building for the post office at Bainbridge, Ga., and until August 19 of a one-story building for the post office at Cedartown, Ga., in accordance with drawings and specifications, copies of which may be obtained from the custodians of the sites or from the office of the Supervising Architect.

FINANCIAL NOTES.

The Louisville Gas & Electric Company of Kentucky, the new operating company formed by H. M. Byllesby & Company to take over the gas and electric utilities of Louisville, Ky., is now at work, the formalities having been completed July 2. These consisted of meetings of the directors of the companies entering the merger and their formal approval of the change. The corporations which compose the consolidation retain their existence, but only for the purpose of taking care of outstanding obligations and maintaining franchises in effect, the Louisville Gas & Electric Company having charge of all operations. The new company is organized with the following officers, directors and executive committee: H. M. Byllesby, chairman of the board; George, H. Harries, president; Donald McDonald, vice-president and general manager; James B. Brown, vice-president; F. C. Gordon, vice-president; R. J. Graf, secretary; T. B. Wilson, treasurer and assistant secretary; Herbert List, assistant secretary and assistant treasurer; Thomas W. Kennedy, assistant treasurer. It was announced that Mr. Kennedy is to be the permanent secretary, Mr. Graf's election being only temporary. Executive committee: H. M. Byllesby, Donald McDonald and George H. Harries, ex officio; Charles J. Doherty, James B. Brown and J. J. O'Brien. Directors: H. M. Byllesby, J. J. O'Brien, Arthur S. Huey, Otto E. Osthoff, James B. Brown, John W. Barr, Jr., John H. Whallen, Donald McDonald, Charles J. Doherty, Daniel E. Doherty, H. D. Rodman, Judge Matt O'Doherty, Gen. Harries and Robert M. Trimble. Many of the directors are local men. In addition to those elected by the stockholders and directors, Herbert L. Harries, son of the president of the company, has been appointed assistant general manager; Wilbur Hubley, chief engineer of the Louisville Lighting Company, becomes electrical superintendent, and W. H. Crutcher, superintendent of the Kentucky Heating Company, becomes gas superintendent. H. W. Fuller, who has been general manager of the Louisville Lighting Company for the past six months, has returned to Chicago to the general offices of H. M. Byllesby & Company. The stock of the Kentucky Electric Company will be taken over and that company absorbed by the Louisville Gas & Electric Company as soon as the suit of the city to enjoin the merger is formally dismissed. The Louisville Gas & Electric Company of Louisville has $11,000,000 capital stock and $15,000,000 of bonds, of which $7,500,000 have been put on the market. Its holding company is the Louisville Gas & Electric Company of Delaware, incorporated with $18,000,000 capital stock.

The Southern New England Telephone Company will offer 12,046 shares to stockholders at par ($100). Right to subscribe accrues to stock of record July 1, and runs until September 15, 1913. Subscriptions are payable in full on or before December 27, 1913. This increase gives a total of $10,000,000 outstanding stock.

At a meeting of the directors of the Easton Consolidated Electric Company, R. P. Stevens, president of the Lehigh Valley Transit Company, was elected president of the Easton Consolidated Electric Company, taking the place of Joseph S. Lovering, who resigned. R. P. Stevens, J. C. Dawson and Albert L. Smith were elected to the directorate to fill the vacancies left by the resignations of Joseph S. Lovering, Robert L. Montgomery and John S. Bioren. These changes mark the taking of the Easton Consolidated Electric Company by the Lehigh Valley Transit Company, the change taking place on July 1.

The Detroit Edison Company has sold to Spencer Trask & Company and Harris, Forbes & Company, New York, $1,000,000 first-mortgage, five-per-cent bonds, due January 1, 1933. The bonds just sold are the final lot of an authorized issue of $10,000,000, of which $9,000,000 have been outstanding. The issue of these bonds closes the mortgage and it is probable that hereafter Detroit Edison will do all its financing by the sale of its stock to stockholders at par. For several years the company has been doing a part of its financing by the sale of debenture bonds convertible into stock and also by stock. All of the outstanding debentures have been converted into stock.

Dividends.

American Light & Traction Company, regular quarterly of 1.5 per cent on preferred and 2.5 per cent in cash and 2.5 per cent in stock on its common, payable August 1.

Brooklyn City Railroad Company, regular quarterly of two per cent, payable July 15.

Commonwealth Edison Company; the regular quarterly dividend of 1.75 per cent, payable August 1.

Commonwealth Power, Railway & Light Company; the regular quarterly dividends of 1.5 per cent on the preferred stock and one per cent on the common stock, payable August 1, to stock of record July 18.

Northern Ontario Light & Power, Limited; the regular semi-annual dividend of three per cent on the preferred stock, payable July 15.

West Penn Traction Company; regular quarterly of 1.5 per cent on its preferred, payable July 15.

Reports of Earnings.

DETROIT UNITED RAILWAY.

The Detroit United Railway Company reports as follows for May and five months ending May 31:

	1913	1912
May gross	$1,152,954	$ 980,034
Net	382,872	379,671
Other income	19,684	15,547
Total income	402,556	395,219
Surplus after charges and taxes	222,988	219,584
Five months gross	5,110,997	4,363,671
Net	1,669,141	1,536,868
Other income	97,518	81,828
Total income	1,766,659	1,618,696
Surplus after charges and taxes	869,796	728,844

SOUTHWESTERN UTILITIES.

The report of the Southwestern Utilities Company, the financing corporation for the Texas Power & Light Company, controlled by the Electric Bond & Share Company, for the year ended May 31, 1913, shows net earnings of $887,806, an increase of $120,718. The income account for May and the fiscal year compares as follows:

	1913	Increase
May gross	$162,971	$ 22,471
Net after taxes	76,435	17,075
Twelve months gross	2,021,536	296,744
Net after taxes	887,806	120,718

UTILITIES IMPROVEMENT.

The Utilities Improvement Company reports earnings for May, 1913, and the five months ended May 31, 1913, as follows:

May gross	$137,369
Net after expenses	134,500
Surplus after dividends	27,000
Five months' gross	724,319
Net after expenses	712,912
Surplus after dividends	175,412
Accumulated surplus to May 31, 1913	465,162

AMERICAN GAS & ELECTRIC COMPANY.

Six of the principal subsidiary corporations of the American Gas & Electric Company report earnings for May, 1913, and the twelve months ended May 31, 1913, as follows:

	1913	1912
Canton Electric Company		
May gross	$ 29,185	$ 24,016
Net after taxes	13,597	11,170
Surplus after charges	8,633	6,414
Twelve months gross	363,256	325,899
Net after taxes	180,792	162,326
Surplus after charges	123,924	105,188
Marion Light & Heating Company:		
May gross	$ 1,000	$ 16,442
Net after taxes	7,778	5,428
Surplus after charges	3,986	2,351
Twelve months gross	238,016	206,093
Net after taxes	99,794	90,302
Surplus after charges	57,042	54,831
Muncie Electric Light Company:		
May gross	$ 34,713	$ 27,816
Net after taxes	13,863	9,973
Surplus after charges	6,830	3,599
Twelve months gross	424,347	341,580
Net after taxes	182,348	147,321
Surplus after charges	97,597	74,093
Rockford Electric Company:		
May gross	$ 36,491	$ 30,971
Net after taxes	21,049	14,183
Surplus after charges	14,963	6,367
Twelve months gross	437,555	399,949
Net after taxes	225,109	191,680
Surplus after charges	130,296	98,589
Scranton Electric Company:		
May gross	$ 70,278	$ 57,208
Net after taxes	39,545	28,772
Surplus after charges	22,638	16,615
Twelve months gross	852,896	767,019
Net after taxes	505,054	433,369
Surplus after charges	338,382	292,354
Wheeling Electric Company:		
May gross	$ 24,362	$ 18,950
Net after taxes	10,347	7,921
Surplus after charges	5,304	3,883
Twelve months gross	281,697	240,884
Net after taxes	128,614	120,113
Surplus after charges	63,950	73,707

*Decrease.

CLOSING BID PRICES FOR ELECTRICAL SECURITIES ON THE LEADING EXCHANGES AS COMPARED WITH THE PREVIOUS WEEK.

	July 7.	June 30.
American Tel. & Tel. (New York)	129¼	129
Commonwealth Edison (Chicago)	128	128
Edison Electric Illuminating (Boston)	270	270
Electric Storage Battery common (Philadelphia)	45½	46
Electric Storage Battery preferred (Philadelphia)	45½	46
General Electric (New York)	137	135½
Kings County Electric (New York)	129	129
Manhattan Transit (New York)	1¾	1⅝
Massachusetts Electric common (Boston)	13	13
Massachusetts Electric preferred stamped (Boston)	67	67
National Carbon common (Chicago)	*113	*113
National Carbon preferred (Chicago)	*111	*111
New England Telephone (Boston)	138½	138½
Philadelphia Electric (Philadelphia)	21⅝	21⅝
Postal Telegraph and Cables common (New York)	76	76¾
Postal Telegraph and Cables preferred (New York)	64½	66
Western Union (New York)	60½	60¼
Westinghouse common (New York)	59	59
Westinghouse preferred (New York	106	106

*Last price quoted.

PERSONAL MENTION.

JAMES R. MASSEY, formerly connected with the Haenig Electric Company, of Springfield, Ill., has begun business as the Massey Electric Company, at 316 East Adams Street.

F. J. LEPREAU has been appointed assistant western sales manager of the primary-battery department of Thomas A. Edison, Incorporated, for the Central Western territory, with headquarters at 229 South Wabash Avenue, Chicago.

CARL HERING gave a demonstration of his electric-furnace process at the Northampton Institute at an informal meeting of the Faraday Society of Great Britain, on Monday, June 16. Dr. Hering mentioned that several large furnaces were now under construction, one being a three-ton steel furnace.

LUCIUS G. CUSHING, western representative of the Bryan-Marsh Electric Works of the General Electric Company, has returned to Chicago after a year's work in the West. He reports incandescent-lamp business active on the Coast, especially at Los Angeles and San Francisco. Mr. Cushing will spend a month in Chicago and vicinity before returning to the Coast.

T. W. SHELTON, formerly connected with the Indianapolis, Columbus & Southern, the Indianapolis Traction & Terminal Company, and the Northern Ohio Traction and the Illinois Traction system, has accepted a position as general superintendent of the Kankakee & Urbana Traction Company. GEORGE M. BENNETT remains as president and general manager.

E. L. ADAMS and P. V. MARTIN, formerly with the Waterbury Company, New York, have gone into business under the firm name of Martin & Adams, manufacturers' agents, 8 and 10 Bridge Street, New York City. Messrs. Martin and Adams have had a long experience in the marketing of electrical goods, and have already made arrangements for the handling of several good accounts. A number of lines are still open for representation.

FRANK B. KNIGHT was married on the morning of Saturday, June 21, to Mrs. Lillian Ballard, at Dallas, Tex., the ceremony being performed by the Rev. G. M. Gibson. Mr. Knight is special agent of the Southwestern Telegraph & Telephone Company, and has a wide circle of acquaintances throughout Texas and other states, his connection with the Bell Telephone interests having extended over a long period in various parts of the country. Mr. and Mrs. Knight will visit South Texas before being at home in Dallas to their friends.

WILLIAM MARCONI, the noted inventor of wireless telegraphy, sailed on the morning of July 2 on the *Mauretania* with Mrs. Marconi for England. With regard to his wireless plans and future work, Mr. Marconi said that he had found the long-distance station at Belmar, N. J., well under way, and that it was expected to have it open for business in October, communicating directly with the English station. After he attends to some business in London, Mr. Marconi will start for Norway to look after the construction of the wireless station there. This station will also be in direct communication with a powerful wireless station on the Atlantic Coast independent of the Belmar station.

WILLIAM McCLELLAN, who resigned a short time ago as chief and engineer of the division of light, heat and power of the Public Service Commission of the Second District of New York, has been retained as assistant to the president of the Buffalo General Electric Company. Dr. McClellan was educated at the University of Pennsylvania, and is a member of the council of the University of Pennsylvania Club of New York City, and president of the Associated Pennsylvania Clubs, an organization of the alumni associations of the University of Pennsylvania in all parts of the world. He is a member of the Railroad Club of New York, the Engineers' Club of New York City, and of the University Club of Albany. He is a fellow and manager of the American Institute of Electrical Engineers and a member of the American Society of Mechanical Engineers. He is a director of the Automatic Train Stop Company and of the Campion-McClellan Company, engineers and constructors with offices at Philadelphia. Dr. McClellan, with offices at 141 Broadway, New York City, will assist in the operation and management of public service properties.

OBITUARY.

ALEXANDER H. MATHESIUS, an inventor of many electrical appliances and president of the General Engineering Company, New York, died on July 2, at his home at Arlington, N. J., after a long illness.

NEW INCORPORATIONS.

BROOKLYN, N. Y.—D. & R. Storage Battery Company, Incorporated, has been incorporated with a capital stock of $1,000,000 to manufacture and rent storage batteries. The incorporators are Rudolph Drambourgh, Joseph E. Reid and Adolph F. Lucker, Brooklyn, N. Y.

NEW YORK, N. Y.—The H. J. Jaeger Research Laboratories, Incorporated, have been incorporated with a capital stock of $1,000 for the purpose of electrical research. The incorporators are Herman J. Jaeger, Weehauken, N. J.; Guy V. Williams, White Plains, N. Y.; and Benjamin Marcus, New York, N. Y.

FOREIGN TRADE OPPORTUNITIES.

(Parties interested in the following items should address the Bureau of Foreign and Domestic Commerce, Washington, D. C., and refer to the file number noted.)

NO. 11,214. SUPPLY AND LAYING OF UNDERGROUND CABLES.—The Post and Telegraph Department, of Belgium, invites tenders for the supply and laying of underground cables between Antwerp and Brussels and Ans and Verviers. Particulars may be obtained of the Direction Technique, 32 Place de la Monnaie, Brussels.

NO. 11,219. ELECTRIC DRAINAGE PUMPS.—A copy of specifications have been received from the American Vice Consul at Georgetown, British Guiana, covering proposals for two duplicate centrifugal electric-driven pumps to handle surface drainage water, each pump to deliver 7,200 gallons per minute, with net head varying from 6 to 14 feet, with tide.

NEW PUBLICATIONS.

GLARE.—This is the title of a little pamphlet published by the Illuminating Engineering Society's Committee on Glare from Reflecting Surfaces. The committee has produced this little booklet in the hope of interesting publishers in making their publications readable with less eye-strain by abandoning the use of glazed or calendered paper and substituting for it the glare-free uncoated paper which is now readily obtainable. To make this appeal more forceful, half of the booklet is printed on highly glazed paper and the other half on unglazed paper, the pronounced glare from the former being strikingly noticeable.

CONCRETE FOOTINGS.—The Engineering Experiment Station of the University of Illinois has issued Bulletin No. 67, entitled "Reinforced Concrete Wall Footings and Column Footings." This bulletin gives the results of tests to destruction of a large number of full-sized reinforced concrete wall footings and column footings. The tests give the first experimental data of the action of structural footings of this kind under conditions approximating those which exist in actual structures. The results of the tests are utilized in the discussion of formulas and principles for the design of reinforced-concrete wall footings and column footings. Copies may be obtained upon application to W. F. M. Goss, Urbana, Ill.

DATES AHEAD.

Ohio Electric Light Association. Annual convention, Cedar Point, O., July 15-18.

National Electrical Contractors' Association. Annual meeting, Chattanooga, Tenn., July 16-19.

California State Association of Electrical Contractors. Fourth annual convention, Santa Barbara, Cal., August 13-16.

Michigan Section, National Electric Light Association. Annual convention, Ottawa Beach, Mich., August 18-21.

International Association of Municipal Electricians. Annual meeting, Watertown, N. Y., August 19-22.

Old-Time Telegraphers and Historical Association and Society of the United States Military Telegraph Corps. Annual reunion, Detroit, Mich., August 26-28.

Association of Edison Illuminating Companies. Annual convention, Cooperstown, N. Y., September 8-11.

American Electrochemical Society. Annual meeting, Denver, Colo., September 9-11.

Northwest Electric Light and Power Association. Annual convention, Seattle, Wash., September 10-12.

Pennsylvania Section, National Electric Light Association. Annual convention, Delaware Water Gap, Pa., September 16-18.

New England Section of the National Electric Light Association. Annual convention, Hotel Vermont, Burlington, Vt., September 17-19.

Illuminating Engineering Society. Annual convention, Pittsburgh, Pa., September 22-26.

Colorado Electrical and Industrial Exposition, Auditorium, Denver, Colo., October 4-11.

Electrical Exposition and Motor Show of 1913. New Grand Central Palace, New York, N. Y., October 15-25.

With the Electrical Manufacturers

Duncan Electric Manufacturing Company, La Fayette, Ind., has sent out folders calling attention to the merits of its direct-current watt-hour meters and particularly of its large three-wire house type meter.

The Emerson Electric Manufacturing Company, St. Louis, Mo., reports that the hot weather in June created the strongest demand ever experienced for Emerson fans, but it has plenty of fans left in stock for further brisk demands.

Line Material Company, South Milwaukee, Wis., manufacturer of the Kyle line of insulator brackets, outdoor lighting brackets and other line-construction material, announces the establishment of offices at 114 Liberty Street, New York City; 229 Sherlock Building, Portland, Ore., and 915 Olive Street, St. Louis, Mo.

The Thompson Electric Company, Cleveland, O., has issued a pamphlet on the Thompson high-voltage series-cutout hanger for street series arc lamps. This hanger is of simple, compact and rugged construction and absolutely cuts the lamp out of circuit before it can be lowered. The line circuit remains intact whether the lamp is connected or not.

Rome Wire Company, Rome, N. Y., manufacturer of electrical wires, has added another romantic card to its series of attractive monthly calendars. The charming picture on the one for this month very timely depicts an amorous couple "in the same boat," this being both literally and figuratively an appropriate caption for the happy victims of Cupid's darts shown in the sketch.

Pyrene Manufacturing Company, New York, N. Y., maker of the well known Pyrene fire extinguisher, sent out to its friends a fine souvenir commemorating our country's July Fourth and extending hearty greetings for the day. It recalled the historic event of 137 years ago, the importance of annually celebrating it and proposed in an attractive pictorial way a toast to "Our Country."

Fidelity Electric Company, Lancaster, Pa., announces that in addition to its line of direct-current motors in sizes from one-fortieth to 30 horsepower, and its line of variable-speed, alternating-current motors, sewing-machine motors, fans, etc., it has added a line of induction-type small power motors in sizes up to and including one-half-horsepower, suitable for application to all classes of small machinery.

California Automobile Company, Los Angeles, has been organized to manufacture electric automobiles. The car will be known as the Beardsley Electric. John T. Shannon, electrical engineer of the company, is supervising the work of constructing the cars. He and V. S. Beardsley will make a trip to the East where they will select material for the company's first year's output. It is intended to make the business of national proportions.

National X-Ray Reflector Company, 235 West Jackson Boulevard, Chicago, has issued several advance sheets for its forthcoming catalog B; these show a number of designs of illuminated-bowl indirect lighting fixtures. The lighting of the translucent bowls is obtained in two ways: Where a single lamp is used, the bottom of the opaque mirror-glass reflector is cut away; where a cluster of lamps is used, all but one are provided with indirect reflectors and the bottom lamp alone is used for illuminating the bowl.

Standard Underground Cable Company, Pittsburgh, Pa., announces that the litigation in regard to copper-clad wire, which has been contested in the United States court in Pittsburgh for the past two and a half years, between the Duplex Metals Company, complainant, and itself as defendant, was virtually decided on June 25, when the case came before the court on motion made by the complainant to dismiss the bill in respect to patent infringement. The bill as originally filed charged infringement of the patent and infringement of a trade-mark. The motion made by complainant was to dismiss without prejudice; that is to say a dismissal leaving the complainant in a position to renew the suit at its pleasure. The motion was opposed, defendant contesting that the bill should be dismissed in this regard and a dismissal should be on merits of the question. The court so ordered, the order reading: "Complainant having admitted that defendant's product referred to in the proofs herein does not infringe the Monnot patent in suit (No. 893,932) it is ordered adjudged and decreed that the bill of complaint herein, insofar as it is based on alleged infringement of said patent, be, and the same hereby is dismissed on the ground that defendants have not infringed said patent." The order of the court directs that the complainant pay the costs. The only portion of the suit not thus disposed of is in regard to the right to use the trade name "Copper Clad" and which is expected to go to a hearing in the early fall.

Westinghouse Church Kerr & Company, New York City, have recently received contracts for quite a number of engineering structures, among which are the following: American Cyanamid Company, Niagara Falls, Ont., design and construction, including electrical equipment, heating, plumbing, conveyors, etc., of the following structural-steel reinforced-concrete and tile-block buildings; carbide building, 144 by 110 feet; cyanamid building, 390 by 91; hydrating and granulating building, 229 by 110; cooling building, 110 by 85; raw-material bins, 53 by 26; wash house, 97 by 40; office building, 81 by 31; laboratory, 81 by 31; liquid-air building, 120 by 60; store house, 80 by 40; coke-drier building, 42 by 81; also construction of lime nitrogen silos, 56 by 56 feet, and a lime-kiln building, 115 by 50 feet. A contract has been closed with the British Columbia Electric Railway Company, Vancouver, B. C., for the design and construction of shops at Burnaby, B. C., consisting of a machine, blacksmith and wheel shop and storehouse in a combination building, 355 by 70 feet, the stripping and erecting shop having ten pits; also paint, erecting, woodworking, cabinet, door and sash varnishing shop in a combination building 330 by 130 feet, including an oil and paint-storage basement and oil-serving equipment; these buildings are to be of structural steel and brick on concrete foundations; the contract also includes the construction of a double-deck car barn in Vancouver, 350 by 130 feet, with a small machine shop, store room, oil room and sand apparatus, each track on both the floors having inspection pits; also construction of car barn at North Vancouver 300 by 105 feet of entire fireproof construction; also the construction of a car barn and shops at Victoria, B. C. A contract with Cluett, Peabody & Company, Troy, N. Y., calls for the design and installation of the first section of a new boiler plant providing for two 300-horsepower boilers contained in a building 50 by 30 feet of concrete and steel construction. Hotel Nassau, Long Beach, N. Y., improvements consisting of overhauling machinery, kitchen equipment, pumps, plumbing and sewer connections, rebuilding cold-storage boxes, etc. Northwestern Brass Company, Calgary, Alberta, construction of a reinforced-concrete foundry building 200 by 100 feet with a wing 40 by 73 feet, according to plans prepared by A. B. Baxter Engineering & Appraisal Company, Buffalo, N. Y.

General Electric Company, Schenectady, N. Y., announes receipt of the following among a multitude of orders for generating and power equipment:

Great Falls Power Company, Butte, Mont., two 1,500-kilowatt generators with two 65-kilowatt exciters. South Carolina Development Company, Peake, S. C., for its stations at Columbia, S. C., six 2,500-kilowatt motor-generator sets and switchboard apparatus. Columbus Power Company, Columbus, Ga., three 1,333-kilowatt transformers and switchboard apparatus. Georgia-Carolina Power Company, Augusta, Ga., for its stations at Augusta and Clearwater, Ga., three 2,000-kilowatt, two 1,000-kilowatt and one 500-kilowatt water-cooled transformers; six 750-kilowatt transformers; a 5-kilowatt motor-generator set, and switchboard apparatus. Eastern Michigan Power Company, Jackson, Mich., a 4,000-kilowatt frequency-changer set; seven 500-kilowatt motor-generator sets; seven 500-kilowatt rotary converters; three

3,000-kilowatt, three 1,000-kilowatt and four 500-kilowatt transformers, and switchboard apparatus Shenango Furnace Company, Pittsburgh, Pa., for its plant at Wilpen, Pa., a 375-kilowatt Curtis turbo-alternator with 3-kilowatt motor-generator exciter; a 125-kilowatt motor-generator set and switchboard. Indiana Steel Company, Gary, Ind., a 500-kilowatt motor-generator set with auto-starting panel equipment; a 530-kilowatt motor-generator set; one multi-stage centrifugal turbine and switchboard panels. Northwestern Iron Company, Milwaukee, Wis., for its plant at Mayville, Wis., a 400-kilowatt two-unit motor-generator set and swtchboard. Bethlehem Steel Company, South Bethleham, Pa., three 3,125-kilowatt gas-engine-driven generators; a motor-generator set; a 525-horsepower motor and switchboard. Eastern Steel Company, Pottsville, Pa.. two 750-kilowatt Curtis turbogenerator units and accessories. Pierce, Butler & Pierce Manufacturing Company, Eastwood, N. Y., for electric drive 46 motors ranging from 1 to 150 horsepower; also a 17.5-kilowatt motor-generator set and switchboard apparatus. Brier Hill Steel Company, Youngstown, O., two 175-horsepower induction motors for direct connection with flexible couplings; also 30 and 50-horsepower motors. Ft. Dodge, Des Moines & Southern Railroad Company, Des Moines, Ia., for motor drive in its shops, 39 motors ranging from 1 to 50 horsepower; 13 transformers from 7.5 to 100 kilowatts, switches and control panels. American Printing Company, Fall River, Mass., two 1,500-kilowatt Curtis turbogenerator units. Atlas Portland Company, Idaho, Mo., two 1,500-kilowatt, two 1,000-kilowatt, one 515-kilowatt and three 320-kilowatt synchronous motors with exciters; nine 215-kilowatt transformers; three 600-kilowatt rotary converters, and switchboard panels. Fisk Rubber Company, Chicopee Falls, Mass., 150-horsepower and two 400-horsepower motors and switchboard apparatus. Loose Wiles Biscuit Company, Kansas City, Mo., for its plant at Long Island City, N. Y., three 625-kilowatt also 105 motors ranging from 2 to 35 kilowatt and 15-kilowatt turbo-exciters and a 14-kilowatt motor-generator set; also 105 motors ranging from 2 to 35 horsepower. Robert Gair Company, Brooklyn, N. Y., for power plant of its printing and lithographing works, a 300-kilowatt Curtis turbogenerator. Colgate & Company, Jersey City, N. J., a 500-kilowatt generator with 22-kilowatt exciter and switchboard. Delaware-Hudson Company, Albany, N. Y., for its power plant at Olyphant, Pa., a 665-kilowatt frequency-changer set and switchboard apparatus.

Record of Electrical Patents.

Issued by the United States Patent Office, July 1, 1913.

1,065,923. Igniting Mechanism for Explosive Engines. W. F. Davis, assignor to McKeen Motor Car Co., Omaha, Neb. Includes an electrode shifter.

1,065,927. Controller Regulator. C. P. Ebersole, assignor to American Automotoneer Co., Philadelphia, Pa. Has a pivoted dog whereby the controller lever is rocked in moving toward the "on" position and is not rocked in moving toward the "off" position.

1,065,937 and 1,065,938. Electric Warp Stop-Motion. J. Hancq, Jamestown, N. Y. Is associated with a heddle frame.

1,065,940. Electrical Protective Device. J. O. Holton, Springfield, Mo. Blowing of one fuse automatically connects in another.

1,065,959. Starting and Lighting Apparatus for Motor Vehicles. M. Moskowitz, Montclair, N. J. Includes a small motor-generator, a storage battery and a friction clutch, by means of which the power of the motor-generator can be gradually applied to the crank shaft during starting of the engine.

1,065,967. Incandescent-Lamp Socket. F. Reutter, assignor to Scovill Mfg. Co., Waterbury, Conn. The socket cap has inwardly extending and transversely arranged projections.

1,065,982. Vehicle Propelled by a Combination of Electrical and Mechanical Power. W. N. Stewart, London England, assignor of one-half to F. Harris. Includes a dynamo, of which both the field and armature are rotatable, the former being normally driven by the engine and the latter connected to the transmission gear; the armature may also be connected to the engine.

1,065,983. Insulator. M. E. Stockwell, Los Angeles, Cal. A tubular insulator pin whose upper threaded part is slotted.

1,066,008. Trolley Catcher or Guard. A. W. Hart, Glencoe, O. Has two wire-embracing jaws and a spring between the handles at the opposite ends thereof.

1,066,026. Instrument For Testing the Eyes. F. Lorenz, assignor to F. A. Hardy & Co., Chicago, Ill. Includes an incandescent lamp at one end of the tube, lenses and an adjustable color screen.

1,066,051. Electrical Switching Apparatus. J. C. Rinker, assignor to Western Electric Co. Balls on the movable member confine it to either of two positions.

1,066,074. Insulated Rail-Joint. B. G. Braine and V. C. Armstrong, assignors to Rail Joint Co., New York, N. Y. Has insulation plates and filler plates between the rails and rail-bearing surfaces.

1,066,081. Railway Signal Relay. C. W. Coleman, Westfield, N. J.; K. Coleman, administratrix of C. W. Coleman, deceased, assignor to Hall Signal Co. Covers details of construction.

1,066,084. Electric Measuring Instrument. W. Crawford, New York, N. Y., assignor of one-half to W. S. Howell. An astatic motor watt-hour meter with specially wound overlapping coils.

1,066,147. Electromechanical Telegraph System. W. K. Queen and T. F. Pickett, Needham Heights, Mass., assignors to Q-P Signal Co. Includes both visual and audible signal apparatus.

1,066,148. Printing-Telegraph System. F. B. Rae, Glen Ridge, N. J., assignor to New Burlingame Telegraphing Typewriter Co. An alternating-current system depending on variation of potential.

1,066,159. Electrical Device for Transmitting to a Distance Continuous or Intermittent Angular Movements. F. Spalazzi, Naples, Italy. For repeating movements of a rotating shaft connected to a switch which successively sends current in line wires to a repeating motor.

1,066,175. Dynamo-Electric Machine. J. C. Barry, assignor to General Electric Co. Has liquid-cooled brush sets, the connecting pipes of which form bus rings.

1,066,176. Telephone-Call Register. W. G. Bell, Newton, and W. H. Vinto, Boston, Mass; said Vinto assignor to said Bell. Has separate registers for in and out calls, toll calls, line-busy calls, etc.

1,066,183. Carbon for Electric Arc Lamps. H. Caird, assignor to H. M. Hirschberg, New York, N. Y. Has a hollow core in which is a double coiled spring conductor.

1,066,204. Time-Controlling Gang Switch. J. Greene and W. G. Sadleir, Salt Lake City, Utah. The clock has disks with adjustable contact plugs controlling several switches.

1,066,209. Turbine-Generator. F. Ljungstrom, assignor to Aktiebolaget Ljungstroms Angturbin, Liljeholmen, Sweden. On each end of the turbine is a generator whose weight is spring supported.

1,066,215. Electric Box. M. Murray, assignor to Chicago Fuse Mfg. Co., Chicago, Ill. Sectional gang switch box with two sides and the rear wall formed of a single U-shaped sheet with joining edges grooved to interlock and to hold an end plate.

1,066,216. Meter-Testing Cutout. T. E. Murray, New York, N. Y. Includes a gang plug with projecting plates co-operating with the meter terminals and connected to the testing apparatus.

1,066,272. Chemical Reaction by Means of an Electric Arc. J. L. R. Hayden, assignor to General Electric Co. Consists in passing a gas mixture through a low-potential arc, and rapidly cooling the mixture below the temperature at which the reaction can reverse.

1, 066,280. Protective Container for Dry Batteries. I. Kaempfer, New York., N. Y. A strip sealed to the inside of the container and the outside of the cell indicates when an attempt has been made to remove the cell.

1,066,293 and 1,066,294. Alternating-Current Electromagnet. D. L. Lindquist, Yonkers, N. Y. A brake magnet comprising a primary coil, one or two laminated cores and a secondary conductor carried by the core.

1,066,326. Electric Incandescent

Lamp. E. G. Royer, assignor to Societe. Anonyme Oriona, Brussels, Belgium. The metal filament is arranged in regular longitudinal loops and also in transverse loops beneath the former.

1,066,329. Conduit Fitting for Electrical Conduits. G. H. Schwedler, Kansas City, Mo. A Y fitting made of one integral piece with gently curved wireways for the branches.

1,066,380. Electric Signal System. A. H. Caven, Youngwood. Pa. A block-signal system for electric railways.

1,066,385. Trolley Attachment. B. F. Dewees, Logan, W. Va., assignor of one-half to J. R. Henderson and J. B. Woods. On each side of the wheel is a guard arm with upwardly curved ends.

1,066,386. Ophthalmoscope. H. L. De Zing, Maple Shade, N. J. A diagnostic instrument having a battery in the handle, an electric lamp, a reflector and a condenser.

1,066,395. Insulator. O. J. Fisher, Walpole, Mass. A pendent insulator with the upper end secured to a bracket.

1,066,399. Extensible Electric-Light Fixture. F. Garrecht, Idaho City, Idaho. Includes lazy tongs with box-like arms and movable covers adapted to conceal the lamp cord.

1,066,410. Attachment for Telegraph Instruments. R. A. Grout, Davenport, Iowa. A sound amplifier for a relay.

1,066,429. Electric High and Low Alarm for Water Columns. J. E. Gustin, Fort Dodge, Iowa. Includes two alarm-circuit-closing floats.

1,066,432. Control for Electric-Lighting Systems. C. F. Kettering, Dayton, O., assignor to Dayton Engineering Laboratories Co. An automobile-lighting system with independent switch for each circuit and interconnection between some of the switches.

1,066,442. Typewriting Machine. C. H. Vogel, assignor to Underwood Typewriter Co., New York, N. Y. A number of electromagnets are successively energized for moving the carriage.

1,066,453. Make-and-Break Sparking Device for Engines. L. C. Adams, Penetanguishene, Ont., Can. For use on a spark plug.

Reissue.

13,589. Ground-Joint Connection for Electric Conductors. J. C. Vogel, Philadelphia, Pa., assignor to Fairmount Electric & Mfg. Co. Original No. 907,543, dated Dec. 22, 1908. Includes a flexible band passing around the pipe and to which is secured a terminal connection for the ground wire.

Patents That Have Expired.

Following is a list of electrical patents (issued by the United States Patent Office) that expired July 7, 1913.

563,250. Multiple-Switchboard System for Telephone Exchanges. O. A. Bell, Brooklyn, N. Y.

563,254. Electric Railway. H. Brandenburg, Chicago, Ill.

563,257. Lightning Arrester and Automatic Fuse Block. T. L. Carleton, New Orleans, La.

563,269. Combined Annunciator and Fire Alarm. M. Garl, Akron, O.

563,273. Means for Insulating Electric Conductors. T. Guilleaume, Mulheim-on-the-Rhine, Germany.

563,274. Electric Cable. T. Guilleaume.

563,282. Electric Railway. E. Lachmann, Hamburg, Germany.

563,288. Electrical Production of Chemical Reactions. W. Lobach, Chicago, Ill.

563,290. Method of Automatic Current Regulation of Dynamo-Electric Machines. F. H. Loveridge, Coldwater, Mich.

563,294. Apparatus for Selective-Signal Systems. F. C. McBerty, Downer's Grove, Ill.

563,302. Scenic-Theater Apparatus for Producing Moon Effects. A. J. Oehring and A. L. Tucker, Chicago, Ill.

563,303. Scenic-Theater Apparatus for Producing Cloud Effects. A. J. Oehring and A. L. Tucker.

563,304. Electrically Controlled Boat-Steering Apparatus. C. E. Ongley, New York, N. Y.

563,306. Scenic-Theater Stage. W. R. Patterson, Chicago, Ill.

563,315. Electric Arc Lamp. C. E. Scribner, Chicago, Ill.

563,316 and 563,317. Speed-Regulator for Dynamos. C. E. Scribner.

563,318. Bridging Bells. C. E. Scribner.

563,319. Incandescent Lamp. C. E. Scribner.

563,320. Multiple-Switchboard System for Telephone Exchanges. C. E. Scribner.

563,321. Incandescent Lamp. C. E. Scribner.

563,322. Telephone Circuit. C. E. Scribner.

563,323. Testing Apparatus for Multiple Switchboards. C. E. Scribner.

563,324. Electric Police-Signal System. C. E. Scribner.

563,325. System of Current-Distribution for Substation Telephones. C. E. Scribner.

562,326. Contact-Point for Electrical Instruments. C. E. Scribner.

563,327. Telephone-Exchange Switchboard. C. E. Scribner and P. Warner, Chicago, Ill.

563,333. Spring-Jack for Telephone Switchboards. H. B. Thayer, New York, N. Y.

563,334. Apparatus for Producing Scenic Effects. A. L. Tucker, Chicago.

563,335. Circuit Re-establishing Cut-out. A. L. Tucker and F. H. Loveridge, Chicago, Ill.

563,336. Electric Signaling Apparatus. F. W. Turner, Newton, and W. M. Chapman, Needham, Mass.

563,337. Brush for Arc Dynamos. H. H. Wait, Chicago, Ill.

563,342. Cable-Terminal Attachment. A. T. Welles, Chicago, Ill.

563,352. Individual Calling Apparatus. W. W. Alexander, Kansas City, Mo.

563,374. Automatic Block Signal and Anticollision Appliance for Railways. H. W. Harris, Raleigh, N. C.

563,379. Flexible Mica Insulating Sheet. C. W. Jefferson, Schenectady, N. Y.

563,395. Telephone Transmitter. W. A. Moore, Brooklyn, N. Y.

563,407. Electric Switch. C. G. Perkins, Hartford, Conn.

563,424. Mechanical Movement. E. A. Sperry, Cleveland, O.

563,425. Power Gearing for Electric Cars. E. A. Sperry.

563,426. System of Electrical Distribution. C. P. Steinmetz, Schenectady, N. Y.

563,427. Compound-Wound Multiphase Generator. C. P. Steinmetz.

563,428. Storage Battery. W. J. Still, Toronto, Canada.

563,440. Electric Motor. E. J. Berg, Schenectady, N. Y.

563,442. Electrical Signaling Apparatus. S. S. Bogart, Schraalenburg, N. J.

563,443. Electrical Selector. S. S. Bogart.

563,453. Magneto-Electric Machine. P. J. Crouse and E. W. Milgate, Utica, N. Y.

563,474. Automatic Fire-Alarm. J. W. Frost, New York, N. Y.

563,482. Insulating-Support for Rails of Electric Railways. P. Haley, Chicago, Ill.

563,491. Electric Tunneling Machine. H. R. Keithley, Chicago, Ill.

563,564. Apparatus for Insulating Magnet Wire. E. F. Cabezola, Trenton, N. J.

563,575. Reversing Controller for Electric Motors. A. C. Dinkey, Munhall, Pa.

563,586. Automatic Repeater. J. W. Frost, New York, N. Y.

563,599. Magneto-Electric Generator. A. G. Leonard, New York, N. Y.

563,600. Rheostat for Electric Motors. H. W. Leonard, New York, N. Y.

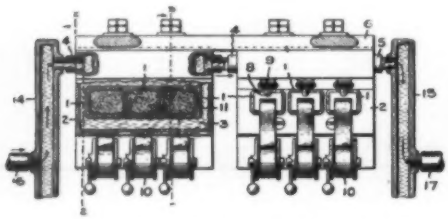
563,614. Telephone System. J. Piel, New York, N. Y.

563,692. Telephone Signaling Circuit. J. S. Stone, Boston, Mass.

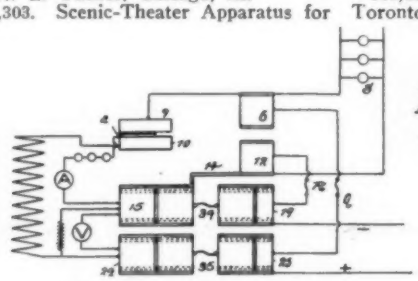
563,695. Electrical Connector. B. L. Toquet, Westport, Conn.

563,715. Electric Heater. T. Grutting, St. Paul, Minn.

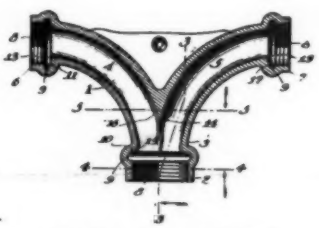
563,716. Electrical Insulating Sheet. C. W. Jefferson, Schenectady, N. Y.



1,066,175.—Liquid-Cooled Brush Gear.



1,066,216.—Meter-Testing Cutout.



1,066,329.—Y Conduit Fitting.